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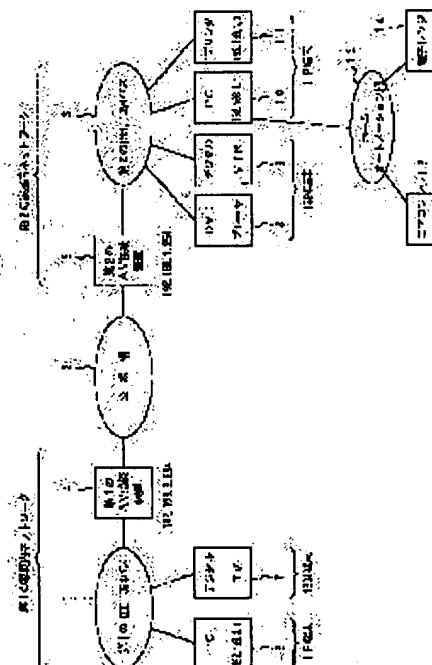
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(54) COMMUNICATION EQUIPMENT, COMMUNICATING CONTROLLING METHOD, SERVICE REGISTERING METHOD, SERVICE PROVIDING METHOD AND EQUIPMENT CONTROLLING PROGRAM REGISTERING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a unified service providing environment independent of a specific network by dynamically describing information concerning a service moving on communication equipment in a configuration information storing means.

SOLUTION: A first AV connector 4, a PC 6 and a digital TV 7 are connected to a first IEEE 1394 bus 1. A second AV connector 5, a DVD player 8, a digital VTR 9, a PC 10 and a printer 11 are connected to a second IEEE 1394 bus 3. Then, another node communicated through communication equipment (PC 6 and 10) can timely recognize an application which the PC 6 and 10 serve at a point of time by accessing to a configuration information storing means. Especially when an operating service dynamically varies, the dynamic variation of the operation of a service becomes more intense, therefore effectiveness of dynamically varying service configuration information becomes significant.



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CLAIMS

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[Claim(s)]

[Claim 1] The communication device which is a communication device equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means to memorize the configuration information about self-equipment, and is characterized by describing dynamically the information about the service which works on self-equipment for said configuration information storage means.

[Claim 2] The communication device which is a communication device equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means to memorize the configuration information about self-equipment, and is characterized by describing collectively the information about the service which works on self-equipment, and the information about the attribute of self-equipment for said configuration information storage means.

[Claim 3] The communication device which is a communication device equipped with the 1st means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means to memorize the configuration information about self-equipment, and is characterized by describing a part of configuration information [ at least ] about the network connected to self-equipment through the 2nd different means of communications from said 1st means of communications for said configuration information storage means.

[Claim 4] The communication device which is a communication device which registers service into the directory agent who exists in the connected network, and is characterized by having a means to register the service of an electronic device which communicates with the protocol depending on the data link of said connected network into said directory agent instead of this electronic device.

[Claim 5] The communication device which is a communication device which notifies the information about service according to the inquiry from the user agent in the connected network, and is characterized by having a means to notify said user agent of the service of an electronic device which communicates with the protocol depending on the data link of said connected network instead of this electronic device.

[Claim 6] The communication device according to claim 4 or 5 characterized by registering or notifying the logic multiplex identifier of self-equipment as a port for access to said service registered or notified in the case of advice to the registration to said directory agent, or said user agent.

[Claim 7] The communication device according to claim 6 characterized by changing into the command of the protocol which depends for this command on said data link corresponding to it, and transmitting to said electronic device when a command arrives at the port specified by said logic multiplex identifier.

[Claim 8] The communication device according to claim 6 characterized by having a response table for mapping to the command of the protocol which depends on said data link corresponding to this command for the command which arrived at the port of said logic multiplex identifier.

[Claim 9] If it cannot communicate if the 1st means of communications is followed, but the 2nd means of communications is followed, the electronic device which can communicate, It is the service registration approach in the communication device connected to the network where the electronic device which can communicate may be connected even if it follows any of the 1st means of communications and the 2nd means of communications. With the electronic device with which registration of the information about the service offered from said each of electronic device through said 1st means of communications was received, and existence has been recognized by said 2nd means of communications and said 1st means of communications about a thing without said advice which leads The information about the service offered by this each of electronic device that should be registered is acquired using said 2nd means of communications. The service registration approach characterized by constituting the service directory information on said network based on the information about said notified service, and the information about said acquired service.

[Claim 10] It is the service provision approach in the communication device to which at least one electronic device which can communicate was connected when it could not communicate when following the 1st protocol, but following the 2nd protocol. The logic multiplex identifier of self-equipment which follows said 1st protocol as a port for access to the service offered by said electronic device is assigned. The service provision approach characterized by changing this command into the command according to said 2nd protocol, and transmitting to said electronic device when a command arrives at the port specified by said logic multiplex identifier.

[Claim 11] The means of communications which operates the register by which the map was carried out to single-address space. An acquisition means by which the attribute information on the electronic device recognized by said means of communications comes to hand. Registration of the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications. The communication device characterized by having the registration means performed working based on the attribute information on said electronic device which came to hand.

[Claim 12] Said registration means is a communication device according to claim 11 characterized by having a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand with said acquisition means, and a means by which the corresponding device control program comes to hand based on said identifier searched for.

[Claim 13] It is the communication device according to claim 11 or 12 which the attribute information on said electronic device is described by the configuration information storage region where it was beforehand set in said electronic device, and is characterized by said acquisition means receiving said attribute information by reading the content described by said configuration information storage region.

[Claim 14] Said single-address space is a communication device given in claim 11 characterized by being provided in the form of an IEEE1394 bus thru/or any 1 term of 13.

[Claim 15] A communication device given in claim 12 characterized by using the identifier which can direct the specific resource of an external network as an identifier of said device control program thru/or any 1 term of 14.

[Claim 16] The communication link between a predetermined electronic device and other communication devices which can be communicated with a means to operate the register by which the map was carried out to single-address space the means of communications using a logic network -- a possible communication device -- it is -- said means of communications -- leading -- said -- others -- with a means to require acquisition of the attribute information on said electronic device from a communication device A means to perform registration of the device control program which controls said electronic device working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand, said -- others -- the communication device characterized by having a means to transmit and receive the information about the directions which operate the register on said single-address space through said means of communications between communication devices.

[Claim 17] It is the device control program registration approach of registering a device control program working [ a communication device ]. The attribute information on the electronic device recognized by the predetermined means of communications which operates the register by which the map was carried out to single-address space comes to hand. Registration of the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications. The device control program registration approach characterized by carrying out working based on the attribute information on said electronic device which came to hand.

[Claim 18] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network. Said 2nd network is minded for the information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment at least. An offer means to provide, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network. The communication device characterized by providing the control means which changes into said 1st command the 2nd command contained in the message received with this receiving means, and controls said service provision equipment by this 1st command.

[Claim 19] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network. A collection means to collect the information about the service which said service provision equipment offers. The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with



this collection means An offer means to provide through said 2nd network at least, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, The communication device characterized by providing the control means which changes into said 1st command the 2nd command contained in the message received with this receiving means, and controls said service provision equipment by this 1st command.

[Claim 20] The communication device according to claim 19 characterized by acquiring the information about the 2nd command corresponding to the information about the service which possessed the table which registered said 2nd command corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service, and were collected with said collection means from this table.

[Claim 21] The communication device according to claim 18 or 19 characterized by changing into said 1st command the 2nd command which possessed the response table of said 1st command and said 2nd command, and was received with said receiving means with reference to this response table.

[Claim 22] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, The communication device characterized by providing the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means.

[Claim 23] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, The communication device characterized by providing the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means.

[Claim 24] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, A creation means to create the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment based on the information about the service collected with this collection means, An offer means to offer the homepage created with this creation means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, The communication device characterized by providing the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means.

[Claim 25] The table which registered the 2nd command depending on the communications protocol of said 2nd network for controlling this service provision equipment corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service is provided. The communication device according to claim 23 or 24 characterized by acquiring the information about the 2nd command corresponding to the information about the service collected with said collection means from this table, and creating said homepage.

[Claim 26] Said control means is the communication device of any one publication of claim 22-24 characterized by changing into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command including the 2nd command depending on the communications protocol of said 2nd network for said message to control said service provision equipment.

[Claim 27] The 2nd command depending on the communications protocol of said 2nd network for said message to control said service provision equipment, The address depending on the communications protocol of said 2nd network and the multiplex identifier for specifying said service provision equipment depending on said 1st network are included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The communication device of any one publication of claim 22-24 characterized by controlling the

service provision equipment identified in said multiplex identifier by this 1st command.

[Claim 28] Said homepage includes the program for generating the message containing the 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The communication device of any one publication of claim 22-24 characterized by controlling service provision equipment by this 1st command.

[Claim 29] Said control means is the communication device of any one publication of claim 22-24 characterized by starting the program for publishing said 1st command by the message received with said receiving means.

[Claim 30] Claims 18 and 19 characterized by including the information which specifies the communications protocol at the time of transmitting information as said message, 22 and 23, and the communication device of any one publication of 24.

[Claim 31] Said 1st network is the communication device of claims 18 and 19 characterized by being IEEE1394, 22 and 23, and any one publication of 24.

[Claim 32] Said 1st network is the communication device of claims 18 and 19 characterized by being LON (Local Operating Network), 22 and 23, and any one publication of 24.

[Claim 33] In the communications control approach for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment is offered through said 2nd network at least. The communications control approach characterized by changing into said 1st command the 2nd command contained in this message, and controlling said service provision equipment when the message containing this 2nd offered command is received through said 2nd network.

[Claim 34] In the communications control approach for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network The information about the service which said service provision equipment offers is collected. The homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment is created. When this homepage is offered through said 2nd network and the message based on this offered homepage is received through said 2nd network, The communications control approach characterized by controlling said service provision equipment by said 1st command published based on this message.

[Claim 35] It is the communication device connected to the 1st network and 2nd network. The 2nd logic multiplex identifier is assigned to the service offered by the 1st logic multiplex identifier of the equipment of the arbitration on said 1st network. The 1st [ said ] logic multiplex identifier and the 1st address of the equipment on the 1st [ said ] network which offers the service. A storage means to memorize the response relation between the 2nd accessible address and said 2nd logic multiplex identifier from said 2nd network, A presentation means to show as service which can access each service of said 1st logic multiplex identifier by said 2nd address and said 2nd logic multiplex identifier from said 2nd network, The communication device characterized by performing the packet transfer for offering the service on the 1st [ said ] network shown with said presentation means between said 1st and 2nd networks based on the response relation memorized by said storage means.

[Claim 36] The communication device according to claim 35 characterized by providing further a collection means to collect the 1st addresses of the equipment which offers said 1st logic multiplex identifier and each service on said 1st network.

[Claim 37] The communication device according to claim 35 characterized by providing an output means to output only the packet which has the identifier memorized by said storage means to said 1st network among the packets inputted as the 2nd storage means which memorizes the identifier of the packet which can be transmitted to said 1st network among the packets inputted from said 2nd network from said 2nd network.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the communications control approach performed by a communication device and these communication devices, such as a computer which may control communication devices, such as a computer equipped with the function which controls remote operation of the directory service in a home network environment, and a device, or a peripheral device, especially the various equipments connected to the general-purpose bus, the service registration approach, the service provision approach, and the device control program registration approach.

[0002]

[Description of the Prior Art] (1) Digitization of electronic equipment is advancing quickly so that development of a multimedia technique may be symbolic in recent years. This inclination has started in office environment first. In the field of hardware, it is going on in the form of installation of a personal computer, digitizations of OA equipment, and those networks. In the field of software, the Internet applications, such as software, such as basic operation (rightsizing of this is carried out and it is shifting to a personal computer etc.) by the host, and a word processor, a spreadsheet, or WWW, etc. are introduced. And Field of application of digitization is circulated increasingly and the development does not know the place which remains.

[0003] The above-mentioned inclination is seen also in the device used by domestic, its related field, etc. That is, digitizations, such as installation of Internet accesses, such as digitizations (namely, DVD, digital VTR, a digital camcorder, etc.) of an AV equipment, digitization of broadcast, and OCN, etc., are advancing steadily.

[0004] The wave of the promoted above technological innovation including office environment can consider going towards a network from now on. That is, the technique of various fields, such as information, a communication link, and broadcast, is bundled by digitization, and it is said that exchange is begun by network.

[0005] As a network technique used as the base for realizing this, it thinks of various candidates. For example, Ethernet has an overwhelming track record in office environment, and it can be said also in the personal computer network in a home that he is the leading candidate. Moreover, ATM is also a strong candidate. This is because it is a general motion that the construction sides (telephone company, CATV, etc.) of an infrastructure will build an infrastructure using this technique paying attention to the description of ATM, such as a high speed, real time, and a broadband.

[0006] these candidates -- in addition, recently -- IEEE1394 -- the network technique (bus technique) attracts attention. This has the description which should observe many, such as a high speed, real time (QOS guarantee), and plug and play, and attracts attention serious as a leading candidate of the connection type of digital AV equipments especially in the AV equipment industrial world. Moreover, the attentions to this technique are beginning to gather also in the computer industrial worlds, such as a personal computer.

[0007] Now, exchange by the network of information, a communication link, broadcast, etc. will be first realized with the spread of the digital instruments for homes by interconnecting these digital instruments with the network technique for which a user asks. It is thought that it is made such and the prototype of a domestic digital network is produced gradually.

[0008] And it is thought that the needs to connect these digital networks mutually actualize as the next phase. For example, they are the needs that the AV equipment connected to 1394 networks of the drawing room of the first floor of user \*\* and the AV equipment connected to 1394 networks of the chamber of the second floor will be interconnected, for example, dubbing etc. will carry out coordination actuation. Or it is a case so that coordination actuation of the device a connected to 1394 networks of user A \*\* and the device b connected to 1394 networks of user B \*\* may be carried out.

[0009] However, in order to realize interconnect of domestic or the digital networks between homes, there are the following problems.

[0010] (i) When saying that the device through a network will be controlled between domestic or a home, the device for getting to know the information: "what kind of service is offered on the network" offer [ "what device to be in which location on a network" or ] Taken does not exist. Unless this device exists, a user cannot recognize existence of specific device/service on a network, and cannot perform actuation or control of an object device, or cannot receive offer of service.

[0011] (ii) Although it is assumed that the part according to a different protocol in interconnect of digital networks is intermingled, the device in which an actuation command etc. is told exceeding a different protocol does not exist.

[0012] For example, when IEEE1394 is used, an Internet-compatible device etc. is able to be intermingled other than the device corresponding to 1394, and the protocol used is not necessarily in agreement. When it is going to operate by remote control in such a mixture situation (i.e., when it is going to control an object device through the network of a different classification), since an IEEE1394 protocol cannot be worked, sending of an actuation command is impossible in the network of a different classification.

[0013] Moreover, although the method of preparing Gateway and realizing remote operation etc. is also considered, the design manual of the Gateway which can be set in such a case etc. does not exist. [0014] In (2) and time, with the spread of rapid personal computers in recent years, and diversification of application, the peripheral device is diversified to storage equipment like a hard disk, a scanner, an input unit like a camera, etc., and the class is continuing increasing.

[0015] In the past, there was no versatility of both application software and peripheral-device hardware, and the peripheral device could be used only from specific application and had inconvenient [ which cannot be used from others ]. this failure is remarkable mainly by the following three techniques current — the partial dissolution is carried out. The technique is the software called the driver which absorbs the difference in control of hardware, the technique of the loader bull driver which can read a driver if needed and can be included in an operating system (hereafter referred to as OS), and a technique of the plug and play which the computer itself detects the connected peripheral device and incorporates a suitable driver.

[0016] Thereby, both the peripheral device and the application program resulted in inducing the positive feedback to which a price also falls by the volume efficiency accompanying versatility, while versatility increased and a user's convenience improved. It has also helped this that bus specification, such as the hardware itself, and ISA, PCI, and the connection specification of storage equipments, such as IDE and SCSI, have standardized in a personal computer, of course.

[0017] Recently, the connection specification of a peripheral device with easy management of connection, such as USB (Universal serial Bus) and IEEE1394, and wiring is being adopted. From several pairs of those, since these are connection of the twisted pair line, they can be used also as a simple network. It is equipped with the high-speed transfer capability which is equal to the system bus of the past computer, and since picture transmission is possible for IEEE1394, it is leading also as connection specification of household-electric-appliances devices, such as TV and video. Moreover, all control is performed by IEEE1394 specification by the R/W to the register mapped by the address space of the 64-bit format standardized in IEC1212 (ANSI/IEEE Std 1212 Control and Status Register(CSR) Architecture for Microcomputer Buses[ISO/IEC13213]). For this reason, a peripheral device can have an interface independent of the architecture of the host processor controlled by the storage device like SCSI specification currently used. [ many ]

[0018] The prerequisite from which the above-mentioned wide use serves as an advantage on the other hand is that the driver corresponding to various peripheral devices is offered with OS. To this both, the vendor of OS and the vendor of a peripheral device must cleave a big effort. By the operating system of Microsoft, and Windows 95, various drivers are actually contained by as many as 40 floppy disks. Although these all are not drivers, of course, there are not few rates of occupying to the whole. Since the software of driver software depends on OS, software firms must prepare a driver for every OS. A device driver is because it is closely connected with the memory management of OS and is generally operating. It cannot be overemphasized that the part for which the OS itself depends on the architecture of a host processor is large.

[0019] As an attempt which raises the versatility of a device driver, the approach using a general-purpose protocol is in the communication link with a peripheral device, or control as it realizes by SCSI, IEEE1394, and USB. It is the method with which the driver to which OS transmits the packet of SCSI or IEEE1394 is offered, and the device driver of a device proper controls each peripheral device using the driver. It is SCSI even if equipment connection interfaces, such as SCSI and IEEE1394, differ in the same OS, if this method is taken. The driver of the part which controls equipment proper, such as HD and a printer, can be used in common.

[0020] There are some approaches also in such general-purpose contact architecture. In addition to the communication link, the protocol of control command is also prescribed by SCSI. Although the correspondence procedure is prescribed by IEEE1394, the command of control was not specified but it has left the room of a

device with various control protocols.

[0021] Moreover, there is a side face which can be used as a network besides the side face as a general-purpose input/output bus in IEEE1394, and mapping of the Internet Protocol to an IEEE1394 bus top is also proposed (DAVIC IP over IEEE1394.1995 Specifications, 1996). However, the interface which unified the field of a communication network and the field as an input/output bus is not yet realized.

[0022] Now, various peripheral devices are available because OS reads the driver corresponding to each device. However, since the device driver itself was dependent on OS and it did not have versatility, it needed development of the driver of a response respectively for every various OS's. For this reason, there was a problem on which development of the device driver by the peripheral-device vendor will be restricted to specific OS through which it spread well. As this result, it concentrates on specific OS with development of a device driver, and the device which cannot be used by other OS's is increasing. This will bar the diversification doubled with the application of OS, and spoils a user's convenience.

[0023] Another problem is that the resource of OS will be occupied by the driver of the equipment which is not used, and API corresponding to a higher-level protocol, when a peripheral device is diversified.

[0024] Moreover, by IEEE1394, not only a peripheral-device control bus but a network utilization gestalt is considered. It is difficult to grasp all the equipments to which near PC to control is connected beforehand, when used in network, and when two or more PCs are connected to the same IEEE1394 bus as the ability to determine directions according to the equipment connected, it is required that it should be determined which PC has a control. However, the system which has solved this did not exist conventionally.

[0025] Moreover, the system which can control the IEEE1394 equipment which is in remoteness through a telephone network or a wide area network did not exist conventionally, either.

[0026]

[Problem(s) to be Solved by the Invention] Even if it is going to control conventionally the device which interconnected in domestic or the digital networks between homes, and minded the network (1) There is no technique for getting to know the information about the service currently offered on the location of each device which exists on a network, or the network. A user Existence of specific device/service has not been recognized on a network, and actuation or control of an object device was not able to be performed, or offer of service was not able to be received. Moreover, when the part according to a different protocol in interconnect of digital networks was intermingled, the user was not able to perform the actuation or control of an object device beyond a different protocol by there being no technique which tells an actuation command etc. exceeding a different protocol, or offer of service was not able to be received.

[0027] (2) Although it is thought that the so-called information appliance which had the various Internet processing facilities also in domestic will enter in the still nearer future, it worries about the current Internet at the serious lack of the address. It is unreal it to be thought for that the household-electric-appliances device which enters into domestic becomes very many numbers, and to newly consider an IP address to these [ all ]. Then, the two following approaches are proposed.

[0028] - Domestic uses a private IP address.

[0029] - The IPv6 (IP version 6) address is used for domestic.

[0030] However, as for the actual Internet (public network), it is actual to be applied by IPv4 (IP version 4), and when the above approaches are taken, it does not have the approach of accessing from the Internet to a domestic device. Although the user on the Internet (public network) needs to recognize the address of domestic various devices before performing those actuation actually even if it uses these as a solution for this problem, although NAT (network address translation) and an IP masquerade are known, there is no mechanism which realizes this.

[0031] (3) Moreover, conventionally, since the device driver was dependent on OS and did not have versatility, it had a trouble [ need / respectively / for every various OS's / the driver of a response / to be developed ]. Moreover, although building a device driver in abundance beforehand when a peripheral device is diversified was performed well, there was a trouble that the resource of OS will be vainly occupied by the device driver of the equipment which is not used and API corresponding to a higher-level protocol.

[0032] It is not dependent on a specific network and this invention aims at offering the communication device which can realize a unific service provision environment, the service registration approach, and the service provision approach, in order to have been made in consideration of the above-mentioned situation and to solve the 1st trouble of the above.

[0033] Moreover, in order to solve the 2nd trouble of the above, this invention aims at offering the communication device which makes accessible service currently offered in each network even from other networks, even when the networks (for example, IPv4, IPv6 and a private address, IPv4 and a private address, IPv6, etc.) where address systems differ are interconnected.

[0034] Moreover, in order to solve the 3rd trouble of the above, it is not dependent on OS or hardware, and this invention aims at offering the possible communication device of registering a device control program, and the device control program registration approach, when the need arises.

[0035]

[Means for Solving the Problem] (1) This inventions (claim 1) are the communication devices (for example, personal computer etc.) equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment, and are characterized by describing dynamically the information about the service which works on self-equipment (the communication device concerned) for said configuration information storage means.

[0036] According to this invention, it communicates through a communication device, and also by accessing this configuration information storage means, a node can recognize timely the application which that communication device has served at that event, the directory service of a network configuration and the service detection of a migration node of it are attained, and its flexibility of employment of a network improves. Especially the effectiveness of changing service configuration information dynamically, since dynamic change of operation of the service will become more intense with [ the case where operation service changes dynamically, and when service is realized by software ] install of software, version up, etc. will become very big.

[0037] The means of communications which operates the register with which the map of this invention (claim 2) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (It is [ for example, ] a personal computer etc.) and is characterized by describing collectively the information about the service which works on self-equipment (the communication device concerned), and the information (for example, Vendor ID, a node capability, etc.) about the attribute of self-equipment for said configuration information storage means.

[0038] In case according to this invention it communicates through a communication device, and also both the configuration information which used service as the base, and the configuration information which used equipment as the base can be notified to a node and these other nodes constitute the directory information of the network where the communication device is connected, it is effective in simplifying more selection of whether it considers as the configuration information according to service, or to consider as the configuration information according to equipment. Since both the user who has got used to the actuation and retrieval according to service, and the user who has got used to the actuation and retrieval according to equipment exist and it corresponds to the both, this is especially useful.

[0039] The 1st means of communications which operates the register with which the map of this invention (claim 3) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (For example, it is a personal computer etc.) for said configuration information storage means It is characterized by describing a part of configuration information [ at least ] (for example, information on a terminal, information on service) about the network connected to self-equipment (the communication device concerned) through the 2nd different means of communications from said 1st means of communications.

[0040] According to this invention, nodes other than the communication device concerned connected to the 1st means of communications The network configuration information connected to the communication device concerned at the 2nd means of communications It becomes possible to recognize through this configuration information storage means. This result, It becomes possible to recognize the configuration information of the whole network which interconnected through the configuration information storage means through the 1st means of communications, and, therefore, it becomes possible to attain simplification of structure, such as a network control and network service registration, and time and effort.

[0041] This inventions (claim 4) are communication devices (for example, personal computer etc.) which register service into the directory agent who exists in the connected network, and are characterized by having a means to register the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network into said directory agent instead of this electronic device.

[0042] According to this invention, a directory agent As opposed to the directory service of the protocols (for example, network layer protocols, such as IP etc.) with which it works It becomes possible to register the services (for example, AV/C protocol of IEEE1394 etc.) offered with data link layer protocols (for example, IEEE1394 layer etc.). Consequently, a directory agent or a directory service becomes that offer layer is fair and possible [ being searched ] about the service developed on the network, and becomes possible [ aiming at simultaneously improvement in a network user's convenience, and improvement in flexibility ].

[0043] This inventions (claim 5) are communication devices (for example, personal computer etc.) which notify the information about service according to the inquiry from the user agent in the connected network, and are characterized by to have a means notify said user agent of the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network instead of this electronic device.

[0044] As opposed to service location service of the protocols (for example, network layer protocols, such as IP etc.) with which, as for a user agent, it works according to this invention It becomes possible to acquire the information about the service offered with data link layer protocols (for example, IEEE1394 layer etc.). Consequently, a user agent or service location service becomes possible [ that offer layer being fair and searching the service developed on the network ], and can aim at simultaneously improvement in a network user's convenience, and improvement in flexibility.

[0045] This invention (claim 6) is set to a communication device according to claim 4 or 5, and is characterized by registering or notifying the logic multiplex identifier of self-equipments (for example, personal computer etc.) as a port for access to said service registered or notified in the case of advice to the registration to a directory agent, or a user agent.

[0046] If it does in this way, said communication device will become possible [ recognizing that it is access to service of said electronic device when there is access to the logic multiplex identifier ], and it becomes possible to perform suitable processing for realizing the service actually.

[0047] On the other hand, a directory agent becomes possible [ offering the unific directory service which becomes possible / answering /, has this logic multiplex identifier as an access point to service of said electronic device, and does not ask the offer layer of service ].

[0048] Moreover, when this logic multiplex identifier is notified as an access point to service of said electronic device, he does not ask a layer, but a user agent will recognize it as what is provided with that service through this logic multiplex identifier, and it is the whole network and he becomes possible [ offering the unific service provision organization which does not ask a layer ].

[0049] In a communication device according to claim 6, this invention (claim 7) is characterized by changing into the command of the protocol which depends for this command on said data link corresponding to it, and transmitting to said electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.), when a command arrives at the port specified by said logic multiplex identifier.

[0050] When doing in this way and said communication device has access to the logic multiplex identifier After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and offers the service actually It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0051] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0052] This invention (claim 8) is characterized by having a response table for mapping to the command of the protocol which depends on said data link corresponding to this command for the command which arrived at the port of said logic multiplex identifier in a communication device according to claim 6.

[0053] If it does in this way, said communication device will become possible [ performing command conversion when there is access to the logic multiplex identifier in the procedure for which it was able to opt beforehand ]. By this After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and offers the service actually It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0054] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0055] If this invention (claim 9) cannot communicate if the 1st means of communications is followed, but the 2nd means of communications is followed, the electronic device which can communicate, It is the service registration approach in the communication device connected to the network where the electronic device which



can communicate may be connected even if it follows any of the 1st means of communications and the 2nd means of communications. With the electronic device with which registration of the information about the service offered from said each of electronic device through said 1st means of communications was received, and existence has been recognized by said 2nd means of communications and said 1st means of communications about a thing without said advice which leads The information about the service offered by this each of electronic device that should be registered is acquired using said 2nd means of communications. Based on the information about said notified service, and the information about said acquired service, it is characterized by constituting the service directory information on said network.

[0056] It is the service provision approach in the communication device to which at least one electronic device which can communicate was connected when this invention (claim 10) could not communicate when following the 1st protocol, but following the 2nd protocol. The logic multiplex identifier of self-equipment which follows said 1st protocol as a port for access to the service offered by said electronic device is assigned. When a command arrives at the port specified by said logic multiplex identifier, it is characterized by changing this command into the command according to said 2nd protocol, and transmitting to said electronic device.

[0057] (2) The means of communications which operates the register with which the map of this invention (claim 11) was carried out to single-address space, An acquisition means by which the attribute information (for example, unique ID, unit ID, capability, etc.) on the electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) recognized by said means of communications comes to hand, Registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications It is characterized by having the registration means performed working based on the attribute information on said electronic device which came to hand.

[0058] According to this invention, said device control program will play the so-called role of a device driver, but According to this invention, it is based on the attribute information on the electronic device received by the means of communications which operates the register by which the map was carried out to single-address space. Since the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space is registered, the device control program united with the attribute of the object driven if needed during actuation is incorporable into OS.

[0059] moreover, a device control program -- a network loader -- if provided in a bull form (for example, form described in JAVA language), it will become possible to register a device control program, without asking the classification of OS, and the classification of hardware.

[0060] This invention (claim 12) is characterized by said registration means having a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand with said acquisition means, and a means by which the corresponding device control program comes to hand based on said identifier searched for in a communication device according to claim 11.

[0061] If it does in this way, the device control program which suited the attribute of said electronic device can come to hand if needed, and can be used as a device driver.

[0062] In a communication device according to claim 11 or 12, the attribute information on said electronic device is described by the configuration information storage region (for example, Configuration ROM or configuration memory) where it was beforehand set in said electronic device, and this invention (claim 13) is characterized by said attribute information coming to hand by reading the content said acquisition means was described to be by said configuration information storage region.

[0063] Thus, if it is made for the attribute information on said electronic device to come to hand by reading the configuration information storage region in the electronic device concerned, it is expected that the attribute information on the device will usually be described by the configuration information storage region, and it is expected that the suitable information from which the hand of a coming-to-hand [ a suitable device control program ] sake serves as a loan will be acquired.

[0064] This invention (claim 14) is characterized by offering said single-address space in the form of an IEEE1394 bus in a communication device given in claim 11 thru/or any 1 term of 13.

[0065] Since an IEEE1394 bus can be interpreted as a bus which realizes single room, it is possible to adopt the above-mentioned device as it is, dynamic loading through the network of the device driver of the network which was originally difficult becomes possible, and it can raise a user's convenience by leaps and bounds.

[0066] This invention (claim 15) is characterized by setting to a communication device given in claim 12 thru/or any 1 term of 14, and using the identifier which can direct the specific resource of an external network as an identifier of said device control program.

[0067] Thus, it becomes possible for the device control program of said electronic device to come to hand from



an external network a network loader built, then if needed, and said communication device is opened from the constraint that it must have all the device control programs assumed beforehand, and becomes possible [ enjoying various advantages, such as economization of the capacity of a disk or OS, and version up of software, ].

[0068] A device control program is preferably described in JAVA language etc.

[0069] The communication link between a predetermined electronic device and other communication devices (the 2nd communication device) which can be communicated this invention (claim 16) with a means to operate the register by which the map was carried out to single-address space. It is a possible communication device (the 1st communication device) by the means of communications using a logic network. said means of communications -- leading -- said -- others -- a communication device (the 2nd communication device) -- receiving -- said -- an electronic device A means to require acquisition of (attributes [ for example, ], such as personal computer, peripheral-device, AV equipment, and household-electric-appliances device) information (for example, unique ID, unit ID, capability, etc.). A means to perform registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand. It is characterized by having a means to transmit and receive the information about the directions which operate the register on said single-address space through said means of communications between communication devices (the 2nd communication device) besides the above.

[0070] According to this invention, the communication device (the 1st communication device) which is a control subject. It can have a function for using said electronic device by considering as agency other communication devices (the 2nd communication device) connected through the logic network. It becomes possible to control a remote electronic device not only through a means to operate the register by which the map was carried out on single-address space but through a logic network, without changing the control program which operates the register on single-address space.

[0071] You may make it the means preferably performed working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand have a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand, and a means by which the corresponding device control program comes to hand based on said identifier searched for.

[0072] Moreover, preferably, the attribute information on said electronic device may be described by the configuration information storage region where it was beforehand set in said electronic device, and said attribute information may come to hand by reading the content described by said configuration information storage region with the communication device (the 2nd communication device) besides the above.

[0073] Moreover, said single-address space may be preferably offered in the form of an IEEE1394 bus.

[0074] Moreover, the identifier which can direct the specific resource of an external network as an identifier of said device control program preferably may be used.

[0075] This invention (claim 17) is the device control program registration approach of registering a device control program working [ a communication device ]. The attribute information on the electronic device recognized by the predetermined means of communications which operates the register by which the map was carried out to single-address space comes to hand. It is characterized by performing registration of the device control program which controls said electronic device working based on the attribute information on said electronic device which came to hand by publishing the directions which operate the register on said single-address space to said means of communications.

[0076] In addition, invention concerning each equipment [ more than ] is materialized also as invention concerning an approach.

[0077] Moreover, the above-mentioned invention is materialized also as a medium which recorded the program for making a computer perform a procedure, a corresponding function, or a corresponding means and in which machine read is possible.

[0078] (3) In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 18) of this invention to the 1st network, and it depends on this 1st network through the 2nd network. Said 2nd network is minded for the information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment at least. An offer means to provide, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network. By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command. It is not

dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0079] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 19) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means An offer means to provide through said 2nd network at least, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command It is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0080] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 22) of this invention to the 1st network, and it depends on this 1st network through the 2nd network An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0081] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 23) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0082] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 24) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, A creation means to create the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment based on the information about the service collected with this collection means, An offer means to offer the homepage created with this creation means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0083] In addition, the communication device (claim 25) of this invention The table which registered the 2nd command depending on the communications protocol of said 2nd network for controlling this service provision equipment corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service is provided. By acquiring the information about the 2nd command corresponding to the information about the service collected with said collection means from this table, and creating said homepage, to a homepage It becomes possible to display the list of remote control of service provision equipment realizable using the 2nd command information (remote-control command), and it becomes

possible to create the homepage which had and enumerated the remote-control approaches which can be employed.

[0084] The communication device (claim 26) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means By changing into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command When the 2nd specific command information (remote-control command) is received through said receiving means If the table corresponding to the above is referred to, it comes to be turned out what kind of actuation it should just perform to the equipment (service provision equipment connected to the 1st network in this case) of a request of the 1st network.

[0085] The communication device (claim 27) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment, The address depending on the communications protocol of said 2nd network and the multiplex identifier for specifying said service provision equipment depending on said 1st network are included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The node which received the homepage by controlling the service provision equipment identified in said multiplex identifier by this 1st command By working on the object by which hyperlink reference was carried out as 2nd command information (remote-control command) It becomes possible to operate the service provision equipment which became possible [ specifying the service provision equipment connected to said 1st network which is a controlled system, and specifying actuation of the request ], had and was connected to said 1st desired network by remote control.

[0086] The communication device (claim 28) of this invention moreover, said homepage The program for generating the message containing the 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The node which received the homepage by controlling service provision equipment by this 1st command The program (JAVA program) matched with it is started. It becomes possible to operate the service provision equipment which it became possible for the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request to be made to publish, and had and was connected to said 1st desired network by remote control.

[0087] The communication device (claim 29) of this invention moreover, said control means By starting the program (for example, CGI script) for publishing said 1st command by the message received with said receiving means The node which received the homepage starts the program (CGI script) matched with it. the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request -- issuance \*\*\*\*\* -- it becomes possible to operate the service provision equipment which what of became possible, and had and was connected to said 1st desired network by remote control.

[0088] Moreover, in case the communication device (claim 30) of this invention transmits information in response to the demand from the partner node which received said homepage by including the information which specifies the communications protocol at the time of transmitting information as said message, the sending-out approach can be specified now, and it can have it, and can send information into a transmitting partner certainly. This has him, especially when the partner who should transmit does not have the receiving capacity of a network layer packet. [ effective ] Moreover, when the node which receives transmit information is not supporting the same network layer protocol as the 2nd command information (remote-control command), or when great cost starts the capsulation to the network layer protocol of transmit information, it becomes possible to urge the equipment which received said homepage to the information transmission of those other than a network layer protocol.

[0089] Furthermore, the header information depending on this communications protocol at the time of transmitting the information other than information that the communications protocol at the time of transmitting information to said message is specified may be included.

[0090] The communication device (claim 35, 5th operation gestalt) of this invention It is the communication device connected to the 1st network and 2nd network. The 2nd logic multiplex identifier is assigned to the service offered by the 1st logic multiplex identifier of the equipment of the arbitration on said 1st network. The 1st [ said ] logic multiplex identifier and the 1st address of the equipment on the 1st [ said ] network which offers the service, A storage means to memorize the response relation between the 2nd accessible address and

said 2nd logic multiplex identifier from said 2nd network, A presentation means to show as service which can access each service of said 1st logic multiplex identifier by said 2nd address and said 2nd logic multiplex identifier from said 2nd network, By performing the packet transfer for offering the service on the 1st [ said ] network shown with said presentation means between said 1st and 2nd networks based on the response relation memorized by said storage means The address system for which the 1st network differs from the 2nd network, For example, when the 2nd network is employed for the address system of IPv4 [ the case where the 1st network is employed for the address system of IPv6, when the 1st network is employed for the system of a private IP address ] Access to the service currently offered in the 1st network is realizable to the user of the 2nd network.

[0091] That is, to the user of the 2nd network, the service currently offered in said 1st network shows to the 2nd network as what this communication device offers using the homepage as said presentation means. When there is access to this service from the user of said 2nd network The response relation (address port number translation table) memorized by said storage means is used. By changing the user of said 2nd network, and the packet between these communication devices into the packet of the service compartment for which it is provided in this communication device and said 1st network It will be recognized as exchanging the transparent packet from the service currently offered in the user of said 2nd network, and said 1st network.

[0092] (Claim 36) By having provided further a collection means to collect the 1st addresses of the equipment which offers said 1st logic multiplex identifier and each service on said 1st network, it becomes possible to perform renewal of automatic as said presentation means (for example, a homepage) based on the collection information about service of said 1st network.

[0093] (Claim 37) The 2nd storage means which memorizes the identifier of the packet which can be transmitted to said 1st network among the packets inputted from said 2nd network, By having provided an output means to output only the packet which has the identifier memorized by said storage means among the packets inputted from said 2nd network to said 1st network User authentication can be performed beforehand and trespass of an inaccurate packet to said 1st network can be protected from external networks, such as a public network.

[0094]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of invention is explained, referring to a drawing.

[0095] (1st operation gestalt) The example of the structure of a system which starts this operation gestalt at drawing 1 is shown.

[0096] In this example, as shown in drawing 1, two domestic networks shall interconnect through a public network 2. A telephone network may be used and it may be [ whose public network 2 is ] like the circuit of wide bands, such as ISDN, or a dedicated line the Internet. However, the network with which it is satisfied of a communication band required for utilization and offer of service preferably is used.

[0097] The 1st domestic network consists of the 1st IEEE1394 bus 1. Moreover, the 1st AV contact 4, a personal computer (the following, PC) 6, and digital [ 7 ] one TV shall be connected to this IEEE1394 bus 1.

[0098] The 2nd domestic network consists of the 2nd IEEE1394 bus 3 and home automation network 12. With this operation gestalt, LON (local operating network) of an echelon company shall be used for this home automation network 12. LON of an echelon company is described in detail by obtaining-, for example from homepage (<http://www.echelon.com>) of echelon company etc. information.

[0099] The 2nd AV contact 5, the DVD player 8, digital VTR 9, PC10, and the printer 11 shall be connected to the IEEE1394 bus 3 of the 2nd domestic network. Moreover, PC10 is connected also to the home automation network 12. The home automation network 12 is connected also to an air-conditioner 13 and a microwave oven 14 besides PC10.

[0100] Among the terminal groups connected to these networks, the 1st AV contact 4, PC6, the 2nd AV contact 5, PC10, and the printer 11 have an IP address (here, it considers as a private IP address), respectively, and are the so-called IP terminal. For the IP address of 192.168.2.254 and PC6, the IP address of 192.168.2.1 and the 2nd AV contact 5 shall be [ the IP address of the 1st AV contact 4 / the IP address of 192.168.1.1 and a printer 11 of the IP address of 192.168.1.254 and PC10 ] 192.168.1.2. Thus, the private IP address or the global IP address shall be used for the IP address of the terminal in this operation gestalt (when a public network 2 is not the Internet but ISDN etc.) (when a public network 2 is the Internet), and setting out (setting out of an IP routing table etc.) of the routing device for routing between each terminals shall be performed appropriately. In addition, although a current global IP address is 32 bits, it is likely to become 128 bits in the near future, and the environment which can assign a global IP address to each terminal is becoming actual.

[0101] On the other hand, digital [ 7 ] one TV, the DVD player 8, and digital VTR 9 are 1394 so-called terminals, and are terminals which interpret only 1394 protocol groups (IEEE1394 -1995, IEC1883, IEEE1394AV/C, SBP,

etc.).

[0102] Moreover, an air-conditioner 13 and a microwave oven 14 are the so-called LON terminals, and are a terminal which interprets only the protocol group defined by LON.

[0103] The 1st AV contact 4 and the 2nd AV contact 5 have fundamentally the function which interconnects between two or more networks (they are an IEEE1394 bus and a public network in the case of this operation gestalt), respectively. The internal configuration of these AV contacts 4 and 5 is shown in drawing 2.

[0104] As shown in drawing 2, AV contact of this example has 1394 interfaces 21, the data link switch 22, the public network interface 23, the IP processing facility 24, the FANP processing facility 25, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29. Hardware may realize and software may realize each of these functions, respectively.

[0105] 1394 interfaces 21 are the functions used as an interface with 1394 buses.

[0106] The data link switch 22 is a switch for performing data transfer which straddles between networks. In more detail By reference (for example, reference of a synchronous channel identifier, ATM-VCI, transmission wavelength, etc., etc.) of only a data link layer identifier / information As the data transfer point is known beforehand clearly, it is a switch for transmitting the data which set up with protocols, such as FANP, and transmitted the data inputted from 1394 buses to the public network, and were inputted from the public network to 1394 buses.

[0107] The public network interface 23 is a function used as an interface with a public network. For example, if the data link layer of a public network is ATM, it will have the interface of ATM for the function of ATM signaling etc. logically physically.

[0108] The IP processing facilities 24 are many functions of a series of Internet Protocol (TCP/IP protocol suite), such as TCP/UDP/IP.

[0109] The FANP processing facility 25 is a function to perform the band in the data link layer of the transmission route of data, reservation of a virtual transmission-line identifier, and adjustment. In addition, the detail of a FANP processing facility is explained by reference "network interconnection method" in "REJIDENSHARU environment, the Institute of Electronics, Information and Communication Engineers, the information-network seminar research report IN 97-19, and pp.73 1997 [ -78 or ]" (or Japanese Patent Application No. 8-264496, Japanese Patent Application No. 8-272672, Japanese Patent Application No. 9-52125) etc.

[0110] As for the FANP processing facility 25, it is desirable to prepare, in treating service with the need of guaranteeing a wide band to some extent like image data, and when it does not need a band guarantee, it may be excluded. In addition, it is also possible to use the processing facility which followed the RSVP protocol (Resource ReSerVation Protocol; draft-ietf-rsvp-spec-08.txt of the Internet draft) instead of the FANP processing facility.

[0111] Moreover, you may make it control the activity of FANP processing facility 25 grade according to the service to offer. For example, you may make it determine whether use FANP processing facility 25 grade for every group of an IP address and a port number. Or you may make it determine to use it by the explicit demand from a user.

[0112] The 1394-/IP service location processing facility 26 searches the terminal or service connected to 1394 buses, or receives the registration, and when it is recognized and required what kind of terminal/service should exist on 1394 buses, it has the function which notifies the information outside if needed. The 1394-/IP service location processing facility 26 has the processing facility of a service location protocol (draft-ietf-svrlc-protocol-16.txt of the Internet draft) at least.

[0113] The service location redundancy 27 works a service location protocol in the form of the service location of IP base to a public network side. Moreover, it is not the service or the terminal connected to 1394 buses, i.e., IP base. Also about the protocol terminal only for IEEE1394 / service (in the 1st domestic network, they are the DVD player 8 and digital VTR 9 at digital [ 7 ] one TV and the 2nd domestic network) which can recognize and process only a series of 1394 protocols While this AV contact has the function which advertises these terminals / service by becoming these services or the deputy server of a terminal When the these-advertised service is received from a public network side (generally the IP side), it has the function which notifies them to 1394 and IP command conversion function 29 that it should map in the command of IEEE1394, or service.

[0114] The 1394AV command-processing function 28 is a processing facility of the terminal-control protocols (for example, a 1394 AV/C protocol, SBP, etc.) of IEEE1394.

[0115] the 1394-/IP command conversion function 29 has been sent using IP -- it is -- it is -- the control command (for example, RTSP (Real Time Stream Protocol) etc.; in addition) to send RTSP is explained in detail at Internet draft draft-ietf-mmusic-rtsp-02.ps, for example -- \*\*\*\* -- The terminal-control command (for

example, a 1394 AV/C protocol and the command of SBP) of IEEE1394 with which a 1394 bus top is sent is changed mutually, and it has the function notified to the other party.

[0116] Next, in the 2nd domestic network, the procedure of recognizing the terminal and service which exist on the procedure, i.e., the 2nd domestic network, in which the 2nd AV contact 5 acquires the information about the 2nd domestic network is explained.

[0117] An example of the sequence of the terminal / service collection procedure using a device peculiar to IEEE1394 is shown in drawing 3. The configuration ROM in which the predetermined information about the terminal was written is stored in the terminal connected to 1394 buses, respectively. In drawing 3, the 2nd AV contact 5 reads the configuration ROM of each equipments 8-11 connected with 1394 buses 3 (lead), and gathers information in each equipments 8-11. This information gathering may be performed to all the terminals that lead to 1394 buses 3.

[0118] Below, some examples are shown about the information described to Configuration ROM. Here, it explains taking the case of the configuration ROM of PC10. In addition, that what is necessary is to just be actually recognized as a "register" or "a part of room", although it learns from the specification of IEEE1394 and the phrase "ROM" is used in this example, also when it is not ROM (in the cases of RAM etc.), it shall contain.

[0119] The 1st example of the information described to Configuration ROM at drawing 4 is shown. This example describes the service which that PC10 other than the node information (for example, Vendor ID, node capability, etc.) (31 in drawing 4) which is the fundamental information about that terminal offers as unit information to Configuration ROM. That is, this PC10 has the WWW server and the digital album server function, and these are reflected in the content of the configuration ROM (inside 32 and 33 of drawing 4). Thus, it not only explains what kind of terminal self is, but by describing to Configuration ROM, it becomes possible to make it know what kind of service self is offering to other terminals which lead to 1394 buses. Like especially PC, this function is very useful, when two or more functions are realized by one terminal. As information concretely described by Configuration ROM, they are types of services, the attribute (it is the various parameters used in order to receive the service, for example, they are the maximum data transfer rate, an equipment specification, an active parameter, etc.) of the service, etc.

[0120] By the way, it connects also with the home automation network 12, and PC10 also serves as a server of such home automation. That is, control of the various devices (here, them are an air-conditioner 13 and a microwave oven 14) connected with the home automation network 12 has composition which this PC10 performs. In other words, the terminal which leads to the 2nd 1394 bus 3 means that the various devices connected with home automation 12 network are controllable by accessing this PC10. In order to make the terminal on the 2nd 1394 bus 3 know this, the information (service information) about the home automation network 12 is also stored in the configuration ROM of PC10.

[0121] First, the information which shows that home automation service is offered is stored in Configuration ROM (34 in drawing 4). This may be made to recognize to be one unit on 1394 buses. Next, the information which shows that Aircon Service and microwave oven service are offered as this unit dependence directory is described by Configuration ROM, respectively (inside 35 and 36 of drawing 4). By doing in this way, other terminals which lead to 1394 buses can know now what kind of service is offered how also about the service connected to another network which is not 1394 buses, and recognition of service and the large improvement in the operability are expected.

[0122] Next, the 2nd example of the information described to Configuration ROM at drawing 5 is shown. In the 1st example, the 2nd example has also described the information according to terminal to Configuration ROM besides the description (inside 45-50 of drawing 5) about service to description about the service which the terminal offers having been performed as unit information about the terminal (inside 42-44 of drawing 5). These are stored as unit information, respectively and may be stored as a unit dependence directory, respectively. Moreover, in order to distinguish that they are the information according to terminal, and the information according to service, the field (respectively inside 42 and 45 of drawing 5) which shows those distinction (which unit is it?) may exist.

[0123] Here, the information about the terminal (an air-conditioner 13 and microwave oven 14) connected to PC10 through the home automation network 12 as information according to terminal is stored, respectively (inside 43 and 44 of drawing 5). By referring to these, not only the node connected with 1394 buses but the information about other nodes (at this example, they are an air-conditioner 13 and a microwave oven 14) connected to the node connected with the 1394 buses becomes possible [obtaining on 1394 level], and that of other 1394 nodes is very effective in integrative management and control of a domestic network.

[0124] Moreover, these are reflected in Configuration ROM as well as the 1st example when this PC10 has a WWW server, a digital album server function, etc. (inside 45-50 of drawing 5). The concrete rule of the

description is the same as that of the 1st example fundamentally.

[0125] Next, the 3rd example of the information described to Configuration ROM at drawing 6 is shown. This example is the case where only the information about PC10 self is stored. In this case, since the information is not the description that used service as the base but a node, i.e., the information as equipment about self, will be indicated unlike the 1st example and 2nd example, as unit information, the purport whose self is PC or a PC board (for example, 1394PCI board) is indicated.

[0126] Now, the actuation can be demanded from a user by displaying the terminal / service information on the 2nd domestic network collected with the 2nd AV contact 5 as mentioned above on the console of the 2nd AV contact 5 concerned. As the method of presentation in that case, it is also possible to perform the display according to service, and it is also possible to display the terminal base.

[0127] The example of a screen in the case of performing the display according to service to drawing 7 is shown. An icon (i1-i7) is prepared at a time according to [ one ] the service developed on the 2nd home network like drawing 7 , and a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface.

[0128] Here, the screen display of the icon according to service of drawing 7 does not ask a network classification, but is displayed similarly [ it is / the service connected to the 2nd IEEE1394 bus 3, and the service connected to the home automation network 12 / fair, and ]. This is because it is generally thought that displaying fair as mentioned above is desirable for a user as for to which physical network the service has led in order to be uninterested. The confusion which will be produced when a user is made conscious of a physical network by this can be prevented.

[0129] In addition, there is no need of displaying the information itself written in Configuration ROM not necessarily in a screen, and you may make it display another corresponding information on it. For example, the information currently written in Configuration ROM is considered [ that it is generally a code for experts in many cases, and ], and is considered [ that it is the thin vocabulary of concordance in many cases, and ] by the general user. Though the code which means "digital one VCR" was written to Configuration ROM when the example was given, to Japanese people, this vocabulary has thin concordance. Then, it gets used by the general user and you may make it display it as "deep video" or deep "videocassette recorder" etc. instead of "digital one VCR" in such a case.

[0130] Next, the example of a screen in the case of performing the display according to terminal to drawing 8 is shown. An icon (i11-i15) is prepared at a time according to [ one ] the terminal developed on the 2nd home network like the case according to service, and a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface. Also in this case, by the screen display, a network classification is not asked but the service connected to the 2nd IEEE1394 bus 3 and the service connected to the home automation network 12 are displayed fair.

[0131] As mentioned above, it was the approach of recognizing a terminal or service by reading of the configuration ROM of 1394 buses.

[0132] Next, registration of service using a service location protocol is explained.

[0133] IETF which is the standardization engine of the Internet is examining registration of the service which used the service location protocol, and a retrieval method: these -- an object [ terminal / IP ] -- service -- beforehand -- some -- classifying -- (1) -- the positional information of the server which offers the service to a directory agent (it is also called a directory server in this operation gestalt) is registered according to those services. A user can know the location of service now by asking this directory agent.

[0134] (2) Prepare IP multicast address according to service. the user who is demanding a certain service -- the IP multicast address -- receiving -- " -- the service is where -- the message of the semantics ?" is flown. A user can know now the location of the server which offers the service because the server which offers the service responds to this.

[0135] It has come to be able to perform service registration and retrieval by the two approaches of saying.

[0136] With this operation gestalt, the 2nd AV contact 5 serves as a directory agent of the service location protocol of the above (1).

[0137] IP terminal on the 2nd domestic network (at drawing 1 , they are PC10 and a printer 11) registers the service currently offered into the 2nd AV contact 5 which is a directory agent. First, IP terminal investigates where [ on a network ] the directory agent exists, and completes the procedure for registering service information. It explains making into an example the case where PC10 registers service, and referring to drawing 9 about this.

[0138] PC10 sends out a service request message to the 2nd IEEE1394 bus 3. A service request message is a message of the semantics "the server which offers this service should reply", and more specifically than the



case of this example sends out the message of the semantics "the server which offers the directory service should reply."

[0139] Since the target types of services are specified as a service request message, the "predicate" field is prepared, and it is described as a "directory service" to this field, and this message is further sent out by making the destination into the directory (agent DA) Discovery multicast address (IP address).

[0140] In this operation gestalt, in the 2nd domestic network, in order to use only as the 2nd IEEE1394 bus 3 the network at which an IP packet arrives, the service request message sent out from PC10 reaches the 2nd AV contact 5 and printer 11 which are a directory agent.

[0141] The 2nd AV contact 5 which is the directory agent who received the service request message returns a "directory agent (DA) advertisement" to PC10, in order to notify that self is a directory agent. In addition, since self is not a directory agent, a printer 11 disregards a service request message (a link layer does not usually receive).

[0142] Next, PC10 is receiving a directory agent (DA) advertisement, and a directory agent recognizes existing in the 2nd AV contact 5.

[0143] Next, PC10 performs registration to the directory agent of the service which self offers. With this operation gestalt, PC10 can receive the service request from the outside as a deputy server also about service of the air-conditioner 13 and microwave oven 14 which are further connected with the home automation network 12 while self offers WWW service (concretely http server) and digital album service.

[0144] While PC10 registers the positional information, attribute information, etc. in service registration about each of the WWW service which PC10 self offers, and digital album service, instead of an air-conditioner 13 and a microwave oven 14, the positional information, attribute information, etc. are registered also with each service on the home automation network (LON) 12.

[0145] An example of the content of the registration information on WWW service and digital album service is shown in (a) of drawing 10, and (b), respectively. URL containing the port number determined as the IP address of PC10 for every service as positional information of WWW service and digital album service is used.

[0146] Moreover, an example of the content of the registration information on Aircon Service for which PC10 acts to (c) of drawing 10 and (d), respectively, and microwave oven service is shown. In this case, the port number of PC10 is assigned to each deputy service. In the example of drawing 10, 15000 is assigned to Aircon Service on LON and 15001 is assigned to microwave oven service on LON. By this, if, as for an external terminal, Aircon Service and microwave oven service exist on PC10, moreover, these services will be interpreted as their being services on IP level with \*\*\*\*\*.

[0147] When it wants to access the port number 15000 of PC10 when an external terminal wants to access Aircon Service of the home automation network 12, and to access microwave oven service, it accesses the port number 15001 of PC10. When it is interpreted as on the other hand it being a service request for air-conditioners when PC10 is accessed by the port number 15000 and accessed by the port number 15001, it is interpreted as it being a service request for microwave ovens, and the control command of passed IP is translated into the control command of LON, and this is turned and sent out to the actual device on the home automation network 12 (an air-conditioner 13 or microwave oven 14). About this actuation, it mentions later taking the case of access to Aircon Service.

[0148] Thus, by service registration of drawing 9, WWW service, digital album service, Aircon Service on LON, and the microwave oven service on LON will be registered into the 2nd AV contact 5. If service registration is successful, the 2nd AV contact 5 which is a directory agent will turn service acknowledgement (ACK) to PC10, and will be returned.

[0149] In addition, registration of printer service is similarly performed from a printer 11 to the 2nd AV contact 5.

[0150] As mentioned above, it will register with WWW, a digital album, an air-conditioner, a microwave oven, and the 2nd AV contact 5 each the service of a printer of whose is a directory agent in the procedure of registration of a service location protocol.

[0151] Now, it is possible to constitute the service information on the 2nd domestic network together with the information acquired by this registration procedure and the information acquired by reading of the configuration ROM on IEEE1394 which gave point explanation.

[0152] Although the configuration approach can consider various classes With this operation gestalt, as the example about the service registered with (i) service location protocol this -- preferential -- displaying -- (ii) -- the service which does not appear here -- specifically Are the node which is not recognized in a service location protocol, and about the node recognized in reading of the configuration ROM on IEEE1394 It is the approach of constituting service information based on the information on Configuration ROM, combining the information on both (i) and (ii), and introducing to a user and the exterior as one "service directory information



on the 2nd domestic network."

[0153] The WWW service, the digital album service, Aircon Service, the microwave oven service, the printer service and the DVD player service recognized by reading of the configuration ROM on IEEE1394 recognized in the procedure of registration of a service location protocol, and video service are more specifically doubled, and all services are recognized. And an icon (i21-i27) is displayed at a time according to [ one ] the service developed on the 2nd home network on the console of the 2nd AV contact 5, for example like drawing 7 . Moreover, a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface like the above-mentioned.

[0154] By the way, although the user agent who is the user terminal which receives offer of service can ask a directory agent the information about the service on the IEEE1394 bus to which self is connected and can also obtain it instead, he is with self receiving the advice from each equipment, and can also obtain the information about service with the registration procedure of the information about service to the directory agent who mentioned above, and the same procedure.

[0155] Next, the case where the user (that is, user of the terminal connected to 1394 buses 1) of the 1st domestic network operates the terminal in the 2nd domestic network (that is, terminal connected to 1394 buses 3 or the home automation network 12) by remote control, and does desired actuation through a public network 2 is explained.

[0156] As shown in drawing 1 , the 1st domestic network and the 2nd domestic network interconnect with the public network 2. As mentioned above, a telephone network may be used and it may be [ whose public network 2 is ] like the circuit of a wide band, or a dedicated line the Internet. Moreover, a private IP address or a global IP address shall be used for an IP address (when a public network 2 is the Internet). (when a public network 2 is not the Internet but ISDN etc.)

[0157] Here, the 1st AV contact 4 shall be the directory agent of the 1st domestic network, and shall recognize the service in a network with the same procedure as what explained the 2nd AV contact 5 previously. PC6 and digital [ 7 ] one TV are recognized as a terminal, and, more specifically, a certain service and digital TV service which are offered with PC6 as service are recognized.

[0158] Now, in order to show the service in the 2nd domestic network to the user of the 1st domestic network as first phase, the 1st AV contact 4 tries to collect the service information on the 2nd domestic network (directory information). The 1st domestic network and the 2nd domestic network shall communicate in Internet Protocol in that case. In addition, the technique of this operation gestalt can be similarly applied, when another protocol, for example, IPX, NetBEUI, etc. are used.

[0159] An example of the procedure of information interchange performed to drawing 12 between the 1st AV contact 4 and the 2nd AV contact 5 for collection of service information is shown.

[0160] First, the 1st AV contact 4 sends out the service request which made "predicate" the directory agent towards the 2nd domestic network in order to search the directory agent in the 2nd domestic network. In order to realize this, how to make for example, the number of hop into plurality, and to send an IP multicast (making it a scope include other domestic networks), the approach of sending to the above-mentioned IP multicast address, after attaching source routing or a routing header to the 2nd domestic network, etc. can be considered.

[0161] Here, as an approach of getting to know the IP address, especially IP subnet address (namely, network address) of a house of the other party, for example to the house of the other party, routing information is exchanged by the routing protocol and how to get to know the address of the other party etc. can be considered.

[0162] Now, the 2nd AV contact 5 which is the directory agent of the 2nd domestic network who received this service request tells a directory agent advertisement to the 1st AV contact 4, in order that self may tell the purport which is a directory agent.

[0163] Next, the 1st AV contact 4 sends a service type request to the 2nd AV contact 5, in order to know what kind of service is offered in the 2nd domestic network.

[0164] The digital VTR (this DVTR1394) whose 2nd AV contact 5 is the air-conditioner (this aircon\_lon) connected to LON other than WWW (the service name written by URL is http), a digital album (this album), and a printer (the said lpr) as a service type reply, the microwave oven (this microwave\_lon) connected to LON, the DVD player (this DVD1394) which is 1394 terminals, and 1394 terminals is notified. For example, as shown in drawing 12 , "Service:http://", "Service:album://", "Service:lpr://", "Service:aircon\_lon://", "Service:microwave\_lon://", "Service:DVTR1394://", and "Service:DVD1394://" are notified.

[0165] About the device connected to LON, the service information (URL information showing the location of service) notified from PC10 is notified to the 1st AV contact 4 as it is. That is, about the service registered

with the service location protocol of IP, it has notified to the 1st AV contact 4 as it is.

[0166] About the service which the 2nd AV contact 5 which is the directory agent of the 2nd domestic network has recognized only as 1394 terminals / service In order to try for the 2nd AV contact 5 self which is a directory agent to offer service as a deputy server of the service It is introducing to the 1st AV contact 4 on IP in the semantics of "DVD on 1394", and "DVTR on 1394" using the new service category "service:DVD1394" and "service:DVTR1394."

[0167] Next, the 1st AV contact 4 which received these information goes into the procedure for collecting the detailed information about each received service.

[0168] An example of the collection approach is shown below. That is, about the service which is [ among those ] interested for the 1st AV contact 4 side about all services received by the above-mentioned service type reply, in order to acquire the location and attribute information, a service request and an attribute request are sent to the 2nd AV contact 5 which is a directory agent, respectively. To a service request, it is answered to a service reply (URL : URL; (for example, Service:DVD1394:// 192.168.1.254:20000) which is specifically the location information on the service), and is answered to an attribute reply (attribute information [ on the service ];, for example, attribute information on DVD on 1394) to an attribute request. In addition, for details, it is described by the documents (for example, draft-ietf-svrlc-protocol-16.txt of the Internet draft etc.) of a service location protocol.

[0169] Although the above-mentioned procedure about DVD1394 service is described to drawing 12 , if information is similarly collected about all services the outside of it, the 1st AV contact 4 can collect the service information on the 2nd domestic network like drawing 13 .

[0170] Here, about each service of DVD1394 and DVTR1394, as stated also in advance, the 2nd AV contact 5 can receive the service request from the outside now as a deputy server of these services. That is, instead of 1394 nodes, the 2nd AV contact 5 receives the remote command protocol which is the embodiment of concrete service and which is a protocol of IP, and this is changed into 1394 nodes and 1394 protocols, and is made into them (in addition, it mentions later about the detail). Since it can introduce through the service introduction protocol of IP which is the protocol which does not ask a network about the service (here, they are DVD service and DVTR service) whose exchange is originally possible by doing in this way with 1394 protocol, a network is not asked but it becomes sending of the command to the 1394 above-mentioned node, and controllable from IP node of arbitration (it becomes good control).

[0171] The AV contact 5 of [ 2nd ] the information collected by various replys assigns the port number used as the service window, i.e., the port number for each deputy service, about \*\*\*\*\* service (DVD service and DVTR service) in a deputy. Allocation may be beforehand made by the standardization engine etc. and this port number may be decided by the negotiation of nodes. In the case of this operation gestalt, it is made [ service / on 1394 / DVD ] into 20001 about the DVTR service on 20000 and 1394. By this, moreover, it interprets an external terminal (for example, terminal on the 1st domestic network) as it being service on IP level while it interprets the above-mentioned service as existing on the 2nd domestic network.

[0172] Now, like drawing 14 , on the console, the terminal 4 on the 1st domestic network, for example, 1st AV contact, is a form of the list display of the service which self recognizes, and, in addition to the information about the 1st domestic network, it is displayed based on the information acquired on said service location also about the information on service on the 2nd domestic network (for example, domestic network of OO Mr. \*\*). The method of this display may be based on the same policy as the thing of drawing 11 .

[0173] Next, when an external terminal wants to access various services 2nd domestic [ LAN ], the address and the port number which are introduced by URL of drawing 13 are accessed, respectively.

[0174] For example, a user operates the 1st AV contact 4, brings an image through a public network 2 from the DVD player 8 which are 1394 terminals on domestic [ 2nd / LAN ], and the case where this is projected on digital [ 107 ] one TV is considered.

[0175] Actual actuation of a user is as follows, for example. A user clicks on the icon of the DVD player of drawing 14 first. Then, the manual operation button group for DVD player actuation like drawing 15 is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates the DVD player 8 by remote control. Moreover, a click etc. specifies that an accepting station is digital [ TV ] by a certain input approach.

[0176] An example of the sequence about the command group which flows a actual network top to drawing 16 at this time, and a protocol group is shown.

[0177] First, the 1st AV contact 4 slashes an image into digital [ 7 ] one TV, and it operates the following sequences so that it may perform setting out for displaying this. That is, according to IEC1883 protocol, the synchronous channel on the 1st IEEE1394 bus is secured. At this time, the synchronous channel number of the acquired synchronous channel presupposes that it is #y.

[0178] Next, the 1st AV contact 4 sends a command using the control command (for example, 1394 AV/C protocol) with which it was beforehand set in standardization bodies, such as 1394TAs, in order to turn ON a power source digital [ TV / 7 ] and to project the image from synchronous channel #y on a screen. If a command is received, you may make it return ACK to the 1st AV control unit 4. It means that the circuit from the 1st AV contact 4 to digital [ 7 ] one TV was secured by this.

[0179] Getting [ or ] mixed up with this, the 1st AV contact 4 publishes the command to the DVD player 8 to the 2nd AV control unit 5—like in parallel. Here, the DVD player 8 is interpreting the 1st AV contact 4 as it being IP service. A command is published to the port of the deputy server of the 2nd AV contact 5 (IP address = 192.168.1.254), 20000 [ i.e., ].

[0180] Here, as a command for remote operation, RTSP (RealTime Streaming Protocol) is used, for example. RTSP is a protocol for controlling a remote real-time signal, and it has a discussion in IETF which is the standardization engine of the Internet. For details, it is indicated by Internet draft draft-ietf-mmmusic-rtsp-02.ps.

[0181] The 1st AV contact 4 publishes a command (for example, the SETUP command and the PLAY command) required in order to reproduce the DVD player 8 on RTSP.

[0182] The 2nd AV contact 5 which received the SETUP command of RTSP interprets it as the control to the DVD player 8 being started from now on, and performs reservation of the band for image transmission on the 2nd IEEE1394 bus 3 to which the DVD player 8 is connected, i.e., a synchronous channel. This is performed by IEC1883. Here, the secured synchronous channel number is set to #y. A band may be good also as using experiential values (for example, if it being MPEG 6Mbps(es) etc.), and may include desired value into a message.

[0183] Moreover, the 2nd AV contact 5 which received the PLAY command of RTSP publishes a command to the DVD player 8 with the corresponding command (for example, a command called DVD-PLAY shall specify) to which this was specified as protocols between 1394 terminals, such as 1394 commands, i.e., a 1394 AV/C protocol etc.

[0184] Conversion of such a command is performed by the 1394-/IP command conversion function 29. The flow of the processing is explained referring to drawing 17. The command on IP is received by the service location redundancy 27. Command conversion of the received command is carried out by the 1394-/IP command conversion function 29. As it was called the table 61 corresponding to a command for DVD, and the table 62 corresponding to a command for DVTR, it prepares according to service of the table which described the relation between the command on IP (or actuation), and the command on 1394 (or actuation), the command sent by IP based on the table according to these services is changed into the command of 1394, and, specifically, delivery sending out is directed for this to the 1394AV command-processing function 28. And it is directed in sending out of a actual command by the carrier beam 1394AV command-processing function 28.

[0185] In addition, with the above, when a command flows towards reverse, namely, also when 1394 commands are inputted and it changes and outputs this to the IP command, a procedure becomes the same. That is, 1394 commands are received by the 1394AV command-processing function 28, this is changed into the IP command based on the table according to service in the 1394-/IP command conversion function 29, and this is sent out by the service location redundancy 27.

[0186] Now, if it does in this way and a command reaches the DVD player 8, transmission of actual image data will be performed through synchronous channel #x of the 2nd 1394 bus 3. After an ACK signal returns (an ACK signal may be changed in addition into O.K. of RTSP on public networks (ISDN or Internet)), as for this, actual data transfer is started.

[0187] The 2nd AV contact 5 sends out image data to a public network 2 through the data link switch 22. This may be sent in an MPEG multiplex form in that case.

[0188] The sent-out image data are sent to the 1st AV contact 4 through a public network 2. The 1st AV contact 4 sends the received image data to synchronous channel #y of the 1st 1394 bus 1 through the data link switch 22, and image data are eventually reproduced in digital [ 7 ] one TV. Consequently, the 1st user domestic [ LAN ] can see now the image from the DVD player 8 on domestic [ 2nd / LAN ] in digital [ 7 ] one TV.

[0189] In addition, as mentioned above, it is desirable that the FANP processing facility 25 or other RSVP processing facilities realize the band in the data link layer of the transmission route of image data, reservation of a virtual transmission-line identifier, and adjustment. By using FANP etc., it becomes securable [ the communication resource which does not ask network classification ]. An example of the sequence at the time of making it such is shown in drawing 18. In drawing 18, reservation of the communication resource of the data link which serves as a path of image data by FANP, adjustment of an identifier, setting out of a contact, etc. are performed in advance of sending of actual image data.

[0190] Next, it considers that the 1st user domestic [ LAN ] operates the 1st AV contact 4, and operates the air-conditioner 13 (it is a LON terminal) on domestic [ 2nd / LAN ] as other examples of remote operation through a public network 2.

[0191] Actual actuation of a user is as follows, for example. A user clicks on the icon of the air-conditioner of drawing 14 first. Then, the manual operation button group for air-conditioner actuation is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates an air-conditioner 13 by remote control.

[0192] An example of a sequence is shown about the command group and protocol group which flow a actual network top to drawing 19 at this time.

[0193] First, the 1st AV contact 4 publishes the command to an air-conditioner 13 to PC10 of a deputy server shown on a service location. Here, the 1st AV contact 4 is interpreted as it being IP service whose PC10 offers the air-conditioner 13. A command is published to the port of PC10 which is a deputy server, 15000 [ i.e., ].

[0194] Here, CCCP (Cam CoderControl Protocol) can be used as a command for remote operation. Although CCCP is a protocol for performing control of a remote camcorder through the Internet, control of various electrical machinery and apparatus shall be possible at the same view, and the command group for air-conditioners shall exist in CCCP especially. In addition, the detail of CCCP is indicated by Internet draft draft-ohita-ccc-video-00.txt.

[0195] The 1st AV contact 4 publishes a command (POEWR\_ON command) required to turn ON the power source of an air-conditioner 13 on CCCP.

[0196] PC10 which received the POWER\_ON command of CCCP publishes a command for an air-conditioner 13 with the corresponding command (for example, a command called LON\_POWER\_ON shall specify) to which this was specified as a protocol between the LON command and a LON node.

[0197] Conversion of such a command is performed within PC10. The flow of the processing is explained referring to drawing 20. The service deputy reception function 71 receives the command on IP. Command conversion of the received command is carried out by the CCCP/LON command conversion function 72. The table corresponding to a command for LON, i.e., the table which described the relation between the command on IP (or actuation) and the command on LON (or actuation), is specifically prepared in the CCCP/LON command conversion function 72, it changes into the command which should be sent to an air-conditioner 13 through LON from the command sent by CCCP based on this table, and delivery sending out is directed for this to the LON command issuance function 73. And it is directed in sending out of a actual command by the carrier beam on-command issuance function 73.

[0198] With the above, when a command flows towards reverse, namely, also when the LON command is inputted and it changes and outputs this to the CCCP command, a procedure becomes the same.

[0199] In addition, when an ACK signal returns (the ACK signal is shown in addition as O.K. in; drawing 19 which may be changed into O.K. of CCCP on public networks (ISDN or Internet)) This is also notified to the 1st AV contact 4.

[0200] In addition, it cannot be overemphasized that the mechanism explained with this operation gestalt can be applied not only to a domestic network but to a general enterprise network and the network technique for realizing especially the so-called "mobile environment."

[0201] Moreover, although this operation gestalt explained as a protocol of a network layer, using IEEE1394 and LON as a protocol of IP and a data link layer, it is also possible as a protocol of a network layer to use techniques, such as Ethernet and ATM, as DSM-CC which is advancing the standardization by DAVIC, and a protocol of data link layers, such as IPX.

[0202] By the way, although the function of service location service and the function of command conversion were prepared in AV contact and AV contact offered service with the above-mentioned operation gestalt, the node which is performing AV contact of this operation gestalt, i.e., network interconnect, does not need to perform these functions, for example, it prepares in PC6 or PC10 in drawing 1, and service may be made for them to provide.

[0203] in this case, like the case where AV contact of drawing 2 has realized service Network I/F (equivalent to 1394 I/F21 of drawing 2 R> 2), the IP processing facility 24, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29 The control to which mount in the node of PC6, PC10, or others, and a network communication resource is made to secure further, What is necessary is just to mount the FANP processing facility 25 or the control processing facility by RSVP, when network control, such as control which adjusts the identifier used between networks, is required.

[0204] Moreover, it is also possible to mount the function of service location service and the function of command conversion for differing mutually.

[0205] In addition, although a private IP address is used for the IP address of a terminal when a public network 2 is not the Internet but ISDN etc., or a global IP address shall be used for the IP address of a terminal in the above explanation when a public network 2 is the Internet. For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node (drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes. In this case, from an external network The global IP address of the node which interconnects a network, A group with the port number for pointing to the private IP address (or group of a private IP address and a port number) of the node used as the destination is made into the destination. Transmit an IP packet and a table is referred to in the node which interconnects a network. You may make it change the group of the global IP address and a port number concerned into the private IP address (or group of a private IP address and a port number) of the node used as the destination.

[0206] (2nd operation gestalt) This operation gestalt explains the case where 1394 equipments by which PC with an IEEE1394 interface was connected to the 1394 same buses are recognized and used.

[0207] Generally, various equipments may be connected to 1394 buses and PC does not have the driver software for controlling the information and it about all the equipments connected beforehand.

[0208] So, with this operation gestalt, information on the equipment connected to 1394 buses is collected. The outline of the procedure is as follows.

[0209] i) 1394unit is recognized first. Specifically, it is unique of 1394 nodes. ID and a unit number are acquired.

[0210] ii) Next, category distinction of each unit is performed. And it judges whether it is a category corresponding to a registered logical device.

[0211] An occupancy condition is acquired about iii, next a registered device (a standard driver is used still in this case).

[0212] iv) And the occupancy condition of 1394unit(s) which are not registered is judged.

[0213] Moreover, with this operation gestalt, the following are treated as an event which occurs in asynchronous and changes the configuration of a device driver.

[0214] i) Bus reset of the utilization demand iiIEEE1394 interface of the equipment by application (addition of 1394 equipment, deletion)

iii This operation gestalt is explained in detail below modification of the occupancy condition of equipment.

[0215] First, a hardware configuration is explained.

[0216] The example of a configuration of PC applied to this operation gestalt at drawing 21 is shown. the main memory by which, as for 82, the processor was connected [ 81 ] to the local bus of a processor for PC, as for 83 -- 84 -- a system bus -- 86 and 87 express an IEEE1394 interface and, as for 88, 85 expresses a hard disk for secondary storage, respectively.

[0217] Secondary storage 85, the IEEE1394 interface 86, and the IEEE1394 interface 87 are connected to the system bus 84, respectively. Secondary storage 85 is constituted by the flash EEPROM.

[0218] The hard disk 88 is connected by the IEEE1394 interface 87 in the interior of the case of PC81.

[0219] The IEEE1394 interface 86 is connected to the printer 90 placed out of the case of PC81, FAX91, massage equipment (it is only called massage equipment below; used as reclining seat mold massage equipment) 92, and a toaster 93, respectively. In addition, on explanation, FAX91 shall have a unit corresponding to a FAX function and scanner ability, and a unit corresponding to printer ability, and massage equipment 92 shall have a unit corresponding to the massage device to upper-half-of-the-body parts, such as the back and a neck, and a unit corresponding to the massage device to lower-half-of-the-body parts, such as a guide peg.

[0220] Next, the software structure of an operating system (the following, OS) is explained.

[0221] An example of the software structure in PC81 of this operation gestalt is shown in drawing 22 .

[0222] In the interior of OS of drawing 22 , in 101, the logical device function manager of OS and 102 express a secondary-storage function manager, and 103 expresses 1394 interface management functions, respectively.

[0223] OS manages secondary storage 102 and a hard disk 103 directly. On the other hand, about each hardware of a printer 90, FAX91, massage equipment 92, and a toaster 93, recognition and registration of a device are performed through 1394 function managers (about this procedure, it mentions later).

[0224] 111,112 is a device driver which the subordinate of the secondary-storage function manager 102 has, and controls secondary storage 85 and a hard disk 88, respectively. 113,114 is a device driver which the subordinate of 1394 interface management functions 103 has, and controls the IEEE1394 interfaces 86 and 87, respectively, respectively.

[0225] OS of drawing 22 API (Application Programing Interface) and JAVA 121 expresses a 1394 management object between APIs.

[0226] JAVA of drawing 22 SPI (System Programing Interface) and JAVA In between APIs 122 expresses a logical device management object. 131,132,133,134, respectively A modem, A printer, a scanner, and the logic

device-class object that corresponds unknown are expressed. 131-1-2,132-1,133-1,134-1-3 express the logical device object managed by the logic device-class object of 131,132,133,134, respectively (about the detail of an unknown class, it mentions later).

[0227] OS of drawing 22 API and JAVA In between SPIs 151 to unit1 (104 in drawing 2222 ) of a printer 90 To unit1 (105 in drawing 22 ) of FAX91, 153 152 to unit2 (106 in drawing 22 ) of FAX91 154 expresses the physical device object corresponding to unit1 (109 in drawing 22 ) of a toaster 93 in 156 corresponding to unit2 (108 in drawing 22 ) of massage equipment 92 in 155 to unit1 (107 in drawing 22 ) of massage equipment 92, respectively. Moreover, 161, 162, and 163,164,165,166 express the driver object corresponding to the physical device object of 151-156, respectively.

[0228] An arrow head expresses the reference relation of each object in drawing 22 . By having reference relation, the method of the object of a reference place can be started and a state variable can be read. For example, the physical device objects 151-156 mean being registered as a physical device object which the subordinate of a 1349 management object has by having the reference relation which starts in the 1394 management object 121. 151 is registered into the logical device object 131-2 of a printer class, the driver object 161 is registered into the physical device object 151, and other things are the same.

[0229] Next, initialization of OS is explained.

[0230] After powering on, PC81 reads the program stored in secondary storage 85, and starts OS. Although not asked especially about the general specification of OS, the compiled Java code shall be performed on OS. In addition, it is Java although there is various reference about Java. Language Specification It is explained in detail at <http://java.sun.com>.

[0231] With this operation gestalt, the hard disk 88 connected to the IEEE1394 interface 87 is beforehand decided as 1394 equipments directly managed by OS. the register with which it operates "resemble carrying out reading appearance", and, as for the IEEE1394 device, the hard disk 87 was defined [ the writing of the value to a register, or ] beforehand, as for PC81 -- unique of the IEEE1394 interface of PC81 self By writing in ID shows that PC81 with the IEEE1394 interface 87 uses a hard disk 88 exclusively.

[0232] OS of PC81 has API (Application Programing Interface) which can perform issuance and a response of the transaction request of an IEEE1394 interface from a Java program. The Java code which manages the IEEE1394 device connected to each 1394 interfaces through Above API is performed after starting of OS by initialization of PC81. This is called a 1394 management object. Moreover, OS shall be equipped with the dynamic object loading device which obtains the identifier of the code which corresponds from the identifier of an object class, and generates an object.

[0233] Below, the object by which xx class object and a certain class were substantiated in the object in connection with the xx code and a certain whole class for storing of the Java code and a transmission gestalt is called xx object. For example, Java of the equipment corresponding to a logic device-class object and each physical unit for the object which manages a certain type of all logical units The object which offers API is called a logical device object. Moreover, a certain identifier shall be given to the code of an object and it shall be discriminated from other objects. The identifier may be embedded at object code and may be expressed by the address of ISO1212 format that the file name or it which stores it is stored. On the other hand, the identifier discriminable from other objects shall be given to a meaning by the PC concerned at least at the object. For example, it is the address of the virtual-memory space where an object is stored. In case it is used by IEEE1394 bus, as for an identifier, to be identified by the meaning on an IEEE1394 bus is desirable.

[0234] Next, recognition of a physical unit is explained.

[0235] Completion of initialization of 1394 interfaces by OS generates the 1394 management object 121 and the logical device management object 122. The 1394 management object 121 and the logical device management object 122 hold mutual reference, and they perform recognition and registration of a device, exchanging information mutually.

[0236] The 1394 management object 121 collects the information on the equipment connected to the IEEE1394 interfaces 86 and 87, and recognizes 1394 nodes each. However, the hard disk 87 with which OS was beforehand defined as what is used exclusively at the time of initialization of the 1394 management object 121 is excepted from recognition. The 1394 management object 121 is node in the TOPOLOGY\_MAP register or SPEED\_MAP register which 1394 interfaces each of PC81 have through the above-mentioned 1394 control API. The read-out demand of a configROM field is published to each node for every ID, and it is unique of the node concerned. It will be each unit if ID and unit recognize two or more existence. ID and capability are obtained. The format of these registers is IEC. It is set by 1212 (ANSI/IEEE Std 1212 Control and Status Register(CSR) Architecture for Microcomputer Buses[ISO/IEC13213]), and, for details, omits here.

[0237] The 1394 management object 121 is unique eventually. The list of groups of ID, unitID, and capability is obtained, and these devices are registered. The 1394 management object 121 reads the value of the above-

mentioned register from a printer 90, FAX91, massage equipment 92, and a toaster 93, and generates the 1394 physical-unit objects 151-156 corresponding to each unit. FAX92 and massage equipment 93 have two unit(s), and generate the physical device object 152,153,154,155 which corresponds, respectively. If generation of an object is completed, the 1394 management object 121 will notify completion of physical device registration to the logical device management object 122.

[0238] The equipment removed from the object of recognition is good also as not considering as the object of recognition, when the value which the own register of equipment other than the equipment beforehand occupied by OS expresses occupancy, and shows occupancy there is written in.

[0239] Here, before explaining registration, the structure of a program (here, it is called an object) and actuation which control a device are explained.

[0240] It corresponds to the function of each equipment and 131-1,132-1 and the logical device object of -- provide application with I/O API. Each logical device object is managed by logic device-class objects prepared for every classification, such as a file and a printer. Although each logical device object belongs to only one logic device-class object, one logic device-class object may have two or more logical device objects in a subordinate. For example, although the logical device object 131-1 of a printer belongs to only one logic device-class object 131, the subordinate of the logic device-class object 131 of a printer has two logical device objects of 131-1,131-2.

[0241] A physical device object exists in 1394 units and 1 to 1 response. One physical device object may be referred to from two or more logical device objects. For example, the physical device object 152 is referred to from two logical device objects, the logical device object 131-1 of a printer, and the logical device object 133-1 of FAX, while it supports unit1 of a printer 91.

[0242] With this operation gestalt, PC81 shall have a printer, a scanner, FAX, and the logic device-class objects 131-134 corresponding to each unknown device class. Each logic device-class object is [ -- It has n. ] the logical device object 131-1 to the subordinate. -- It is n and 132-1. -- It is n and 133-1. -- It is n and 134-1. The physical unit with which the Java application performed with PC81 belongs to the difference in mounting of a physical unit through these logical device object at the class of \*\*\*\*\* identitas can be used by the same approach. This is Java for every logic device-class object. It is because SPI is communalized.

[0243] For example, the address and the procedure of an IEEE1394 register at the time of accessing printer equipment are ANSI. X3T10 Serial Bus It is set as Protocol (SBP). A printer is controllable, if a device driver generates the message of an IEEE1394 format in accordance with Above SBP no matter an IEEE1394 interface may be mounting [ what ]. Furthermore, if the device driver is described by Java independent of hardware or OS, as long as the system program interface to the driver of an IEEE1394 interface is the same, in any OS's, the same printer device driver is usable.

[0244] Application can obtain the list of the logic device-class objects 131-134 by requiring a device-class list of the logical device management object 122. The list of the logical device objects belonging to the same types, such as each printer and a scanner, can be obtained from a logic device-class object. The logical device management object 122 also performs management of registration/deletion of a logic device-class object.

[0245] Next, initialization of the logic device-class object by the logical device management object 122 is explained. An example of a logical device management object initialization procedure is shown in drawing 23.

[0246] The logical device management object 122 generates the logic device-class object 131,132,133 corresponding to the device class defined beforehand, a printer, a scanner, and FAX, and makes reference between these objects shown by the arrow head in drawing 2 (steps S11-S14).

[0247] Each logic device-class object of these 131,132,133 initializes following generation (; step S15 to which the logical device management object 122 waits for the completion of initialization in the meantime). Completion of initialization notifies that initialization was completed to the logical device management object 122.

[0248] The unknown logic device-class object 134 which manages the physical device with which the carrier beam logical device management object 122 finally has not been recognized by each logic device-class object of 131-133 in advice of completion is generated and initialized (steps S16 and S17). The logical device management object 122 will be in the completion condition of initialization, if the advice of completion of initialization of an unknown class is received (step S18).

[0249] Next, it explains, taking the logic device-class object 131 for an example about initialization of a logic device-class object. An example of a logic device-class object initialization procedure is shown in drawing 24.

[0250] The logical device management object 122 passes the reference to the 1394 management object 121 to the generate time of a logic device-class object. The logic device-class object 131 requires the reference to a physical device object of the 1394 management object 121 (step S21).

[0251] The 1394 management object 121 will return reference in an order from the physical device object 151 according to the reference which the self-object holds, if reference of a physical device object is required.



[0252] When the reference to the physical device object 151 comes to hand, the logic device-class object 131 starts the attribute value acquisition method of an object 151, and is unique. ID, unit ID and capability are acquired (step S22). These values have beforehand the table which judges whether it agrees in self-device class, and the logic device-class object 131 can judge whether the acquired physical device object 151 agrees in a self-class.

[0253] unique of a physical device 151 ID, unit Since ID was a value which shows a printer, the logic device-class object 131 generates the logical device object 131-1 corresponding to the physical device object 151, and makes initialization start. Also at this time, as for a logic device-class object and a logical device object, it has reference relation mutually, and the logical device object 131-1 is registered as a subordinate of the logic device-class object 131 (steps S23-S24).

[0254] This judgment is unique. ID, unit The combination of not only ID but other attribute value may perform. Moreover, it is unique, without a logic device-class object having a table, ID and unit You may ask the retrieval server which is out of PC81 by using ID as a key.

[0255] Hereafter, succeedingly, the logic device-class object 131 requires the reference to a physical device of the 1394 management object 121, and does the same activity even to the last physical device 156 about 152, 153, and --. Since unit2 of FAX152 has capability of a printer, this is also registered into a printer class object as a logical device object 131-2 (steps S21-S24).

[0256] After an activity is completed about all physical device objects, it waits for the advice of the completion of initialization from the registered logical device object 131-1,132-2 (step S25). If the advice of the completion of initialization from the logical device object 131-1,132-2 is received, the logic device-class object 131 of a printer class will notify completion of initialization to the logical device management object 122 (step S26).

[0257] Next, it explains, taking the logical device object 131-1 for an example about initialization of a logical device object. An example of a logical device object initialization procedure is shown in drawing 25.

[0258] After the logical device object 131-1 initializes own attribute value, it publishes an initialization demand to a physical device 151, and waits for the advice of completion from 151 (steps S31 and S32). Reception of advice of completion publishes advice of completion to the logic device-class object 131 of a printer class (step S33). The physical device object 151 which received the initialization demand determines the device control code corresponding to a physical unit 90, reads it, generates the device control object 161, and registers it into a physical device object.

[0259] Next, it explains, taking the physical device object 151 for an example about initialization of a physical device object. An example of a physical device object initialization procedure is shown in drawing 26.

[0260] In addition, generation of a physical device object is performed by the 1394 management object 121 before generation of a logical device object, and when, as for initialization here, the 1394 management object 121 generates the physical device object 151 unlike generation, the code of a printer control proper is not read.

[0261] The device control code to load is determined as follows, for example. The 1394 management object 121 is attribute value unique. ID, unit It is the attribute value unique to which it has the table which searches for the class name of a device control code from ID, capability, and a logic device-class object, and self has the physical device object 151 in the 1394 management object 121. The inquiry demand containing ID, unitID, and capability is published, and a class name is acquired as the return value (step S41). The identifier of a device control code is good at the pathname which shows the file of the PC concerned as mentioned above. Of course, the inquiry based on attribute value may be published and acquired to the exterior of PC81.

[0262] A device control code is loaded by the dynamic object loading function from the class name acquired by the above-mentioned approach, the device control object 161 is generated, and it registers with the physical device object 151. The physical device object 151 publishes the initialization demand of hardware, after initializing attribute value of the device control object 161 (steps S42-S44).

[0263] It will be read if the code corresponding to a class name exists locally. If the class name shows the resource on the network of RIMOTO, it will acquire from on a network. When it does not exist locally [ even when the class name has not pointed out the resource on a network clearly / a code ], the location on a network is acquired using the retrieval server on a network etc., and a code is read.

[0264] Next, the device control object 161 prepares the packet which performs the register writing for initialization of hardware, and initializes a call and a physical unit 90 for the system call of 1394 transactions. If initialization is completed, the physical device object 151 will publish advice of completion to the logical device object 131-1 (step S45).

[0265] By the way, the thing registered into two or more logical device objects (131-1,133-1) like [ a physical device object ] the physical device object 152. Such a physical device object will receive two initialization demands or more. In the 2nd initialization, if it compares whether it is the same as that of the device control



object which the device control object determined from attribute value gained at a time (step S44), and same and it is [ the same thing is used and ] different, a device control object will newly be read and generated. Although the same device control object 162 is used for a printer class and a FAX class in the physical device object 152, for this, a device control object is Java of both a printer and FAX. It is because it is what supports SPI. The device control object loaded first is Java of a printer class. If only SPI is supported and the FAX class is not supported, the device control object which newly supports both searches and comes to hand, or the support of a FAX class is stopped. If coexistence is impossible, suppose that priority is given to the class loaded first.

[0266] Now, when logical device classification generally increases, it is inefficient-like in respect of utilization of resources, such as memory, to prepare beforehand all the logic device-class objects that may be used. Moreover, when one physical unit may be used from many logic device-class objects and a low order device control program (device control object of this operation gestalt) is changed depending on a high order logic device-class object, the procedure of determining a high order logical device according to a physical device becomes complicated. Especially, it is IEEE. By bus which is introduced into a home like 1394 buses and used also as a domestic network, it is difficult to limit the device connected beforehand.

[0267] It is appropriate in the above-mentioned network for a user to determine the high order logical device rather specified according to a user's utilization gestalt, and to use the connected equipment by the approach. For this reason, with this operation gestalt, by preparing an unknown device class, the usage has recognized strange equipment for the time being, and the approach of newly adding the high order logical device set by equipment so that it might mention later in detail is taken.

[0268] The 1394 management object 121 has two or more logical devices and the table of the class name corresponding to attribute value, and in case a physical device object performs 2nd initialization, the identifier and attribute value of two logic device-class objects may be specified, and you may ask the 1394 management object 121.

[0269] Next, initialization of the unknown logic device-class object 134 is explained.

[0270] The unknown logic device-class object 134 receives the reference to the 1394 management object 121 to a generate time like the logic device-class object 134 to 131-133. And the reference to each physical device object of 151, --, 156 is obtained like initialization of the logic device-class objects 131-133.

[0271] The unknown logic device-class object 134 obtains the reference to the physical device object 151 first. The unknown logic device-class object 134 asks the physical device object 151 whether have the reference to a logical device object, if it has, will stop recognition of the physical device object 151, and will receive the reference to the following physical device object 152. Since each is registered into other logical device objects, the physical device object 151,152,153 does not perform registration as an unknown device.

[0272] On the other hand, the physical device object 154 does not have the reference from a logical device object. The unknown logic device-class object 134 generates the logical device object 134-1 corresponding to the physical device object 154, and registers it into self here. The logical device object 134-1 registers the physical device object 154 into self. The unknown logical device object 134-1 does not require initialization of the physical device object 154. Therefore, a device control object is not registered into the physical device object 154 at this event.

[0273] Initialization with the same said of the physical device object 155,156 is performed hereafter, the unknown logical device object 134-2,134-3 is generated, advice of completion is published, and initialization of an unknown device class is completed.

[0274] The logical device management object 122 will be ended if generation initialization of the logic device-class object defined beforehand and generation initialization of the unknown logic device-class object following it are completed. If initialization finishes, the logical device management object 122 can reply to a device-class list demand from application. Before initialization is completed, the answer which cannot be used is returned to the inquiry from application.

[0275] Next, utilization of the device from application is explained. Here, taking the case of the case where a printer 90 is used, it explains from application.

[0276] In addition, it is Java about the interface between a physical device and a logical device. It is Java about between SPI, a logical device, and applications. It is referred to as API. In these, APIs between OS and Java differ.

[0277] The application program shall know the reference to the logical device object 131-1 corresponding to a printer 90 by predetermined approaches, such as an inquiry to OS.

[0278] For example, application knows beforehand the reference to the logical device management object 122, gains the reference to a printer class through the logical device management object 122, and receives the reference to a printer 131-1 from a printer class. Or the naming service about an equipment configuration may

be offered.

[0279] An application program publishes a printing demand to the logical device object 131-1 by making reference to a postscript file into an argument.

[0280] The logical device object 131-1 gets to know that it is a postscript file from the header information of a file, and develops a postscript file to a bitmapped image. And the logical device object 131-1 publishes a printing demand to the physical device object 151 by making reference to an object including information, such as paper size assignment of those other than a bitmapped image and a bit map, into an argument. In addition, it is desirable to perform queue processing by the logical device object 131-1.

[0281] The physical device object 151 transmits the bit map information corresponding to a printing image to a printer 90 through the device control object 161. That is, the flag which PC81 uses for the CSR register A with which the printer 90 was defined beforehand by the lock transaction is written in. If it succeeds in lock and the royalty of a printer is acquired, next, setting out of the Isochronous channel on the IEEE1394 bus for transmitting data and the transaction which sets up printers, such as paper size and tray information, will be published. If a channel is gained, bit map information will be transmitted and a transfer will be completed, the transaction of the completion of a transfer will be published and the printing directions to a printer will be completed. Since the printing situation in a printer is displayed on a certain CSR register, completion of printing is got to know when a physical device object polls it.

[0282] Next, utilization of the equipment registered as an unknown type is explained taking the case of message equipment 12.

[0283] Software structure when drawing 27 adds a logic device-class object, an example of the new device-class addition demand procedure according [ drawing 28 ] to application, and drawing 29 show an example of the new device-class addition procedure by the logical device management object 122, respectively.

[0284] Application publishes the list acquisition demand of logic device class to the logical device management object 122 (step S51). Acquisition of the reference to the unknown logic device-class object 134 requires list acquisition of a logical device of the unknown device class 134 (steps S52 and S53).

[0285] Application chooses the reference to the logical device object 134-1 corresponding to message equipment 92 from a list, and requires available logical device information (step S54).

[0286] The logical device object 134-1 acquires the attribute value from the physical device object 154, and publishes the retrieval demand of logic device class with the available physical device object 154 to the logical device management object 122. The logical device management object 122 has the table to which a logic device-class name is made to correspond from attribute value like previous statement. A logic device-class name or its list is returned to a logical device 134-1 from this table, and a logical device 134-1 acquires a logic device-class name to a demand, and notifies it to application as logical device information. Of course, it does not matter even if it carries out by asking the server on a network retrieval of a device-class name also here. It is desirable to store explanation by the object code of the default driver of message equipment and the natural language of directions in the storing location of a driver object at least.

[0287] Application chooses the logic device-class name "message equipment" to be used, and publishes a logic device-class registration demand to the logical device management object 122 (steps S55, S56, and S57).

[0288] The logical device management object 122 generates the new logic device-class object 135 corresponding to the specified class name (step S61), and inserts it between the unknown logic device-class object 134 and an unknown class, and the logic device-class object 133 of FAX linked (step S62). And the logical device object 134-1, 134-2 registered into an unknown device class until now is deleted (step S63), and an initialization demand is published to the logic device-class object 135 (step S64). This condition is shown in drawing 27. The procedure of future step S65 and step S66 and the initialization procedure of the new logic device-class object 125 are the same as that of what was already explained. In addition, 135-1 is the newly generated logical device object among drawing 27.

[0289] Here, although the example which searches the logical device corresponding to an unknown device was explained, a new corresponding logical device may be searched from the combination of the existing physical device. For example, it is a case so that available new logical device FAX may be searched with the combination of each physical device with the function of a printer, a scanner, and a modem.

[0290] By having the above-mentioned function, the unnecessary program for controlling the device which is not used usually is not read at the time of initialization of a system, but by reading, when needed, can save resources, such as memory of PC, and can reduce cost.

[0291] Next, the configuration change event of 1394 devices is explained.

[0292] The connection situation of 1394 equipments that PC can be used may change. And by IEEE1394 bus, a configuration can be changed by the insert and remove of a connector working. This modification result must be reflected in a logical device as an addition and deletion of a device object. Moreover, if occupancy of the device

by a certain equipment is completed, the device will become available with other equipments. Below, the procedure of recognizing change of such a configuration is explained.

[0293] Generating of bus reset notifies bus reset to the 1394 management object 121 from 1394 interfaces of OS. Again, the 1394 management object 121 acquires a list of 1394 physical units from TOPOLOGY\_MAP and SPEED\_MAP, and is those unique(s). ID is acquired and a response with a known device is taken.

[0294] First, the 1394 management object 121 makes "unknown" exist attribute value of all physical device objects after bus reset.

[0295] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When in agreement with ID, the equipment is registered and already considers exist as "existence."

[0296] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When not in agreement with ID, the equipment is equipment added newly, carries out generation initialization of the physical device object, and considers exist as "existence."

[0297] They are all NODE(s) about this actuation. After following ID, the physical device object to which exist is unknown deletes it as that from which corresponding equipment was removed. If a physical device object is deleted, it is notified to a corresponding logical device object, and after a logical device object performs a post process and notifies it to a corresponding device class, it will eliminate self.

[0298] If correction of reference by an addition and deletion is completed, the 1394 management object 121 will notify modification of a configuration to the logical device management object 122. Advice will not be performed if there is no change in a configuration.

[0299] The logical device management object 122 which received advice publishes a configuration change demand to each device class.

[0300] The printer class 131 which received the configuration change demand requires reference of a physical device of the logical device object 122 like initialization. It differs from initialization that only the physical device object newly added in the configuration change is applicable to all the physical device objects having been objects in initialization. Each logic device class reads the attribute of the physical device added newly, and if it judges whether it is in agreement with a self-class and is in agreement, it will generate and register a corresponding logical device object.

[0301] Completion of the configuration change of all classes registers the physical device object which initialization of an unknown class was performed and was not registered as which logical device with the added device into an unknown class.

[0302] Next, modification of an occupancy condition is explained.

[0303] In initialization, to the equipment which was judged to be in the occupancy condition by other nodes, and was excepted from recognition, the 1394 management object 121 performs periodic polling, and detects modification of a device occupancy condition by the readout of a register. The device which changed into the condition of not occupying is registered in the same procedure as change of the device configuration described by bus reset. If the PC concerned occupies said equipment exclusively, the value which shows it to the register in which the occupancy condition of equipment is shown for it will be written in.

[0304] Next, the case where a local logical device object is old is explained.

[0305] In such a case, the logic device-class object has the attribute of a version number. Application can publish the updating demand of a logic device-class object to the logical device management object 122. While the logical device management object 122 acquires the version number of the logic device-class object as which updating was required, it requires the newest version number of the archive server of the logic device-class object specified beforehand. If the version number of a local logic device-class object is in agreement with the newest thing and the version number of a local logic device-class object is young, the newest device class will be read from an archive server, and an object will be generated. This logic device-class object does not operate at this event.

[0306] If it succeeds in generation of an object, advice of termination will be published to the existing logical device, and actuation will be terminated. If it is a printer, reception of a new print job will be stopped and it will wait for termination of the print job under activation. Completion of an active job and a post process notifies completion to the logical device management object 122. The logical device management object 122 sends the advice of initiation of a logical device to a logic device-class object, after it changes the reference relation which an old logical device has and a new logical device object succeeds reference relation. The logic device-class object which received advice starts actuation.

[0307] (3rd operation gestalt) The case where the remote IEEE1394 equipment to which PC (thing with the function of the 2nd operation gestalt) connected to the network was connected via networks other than IEEE1394 is controlled by this operation gestalt is explained.

[0308] The example of the structure of a system which starts this operation gestalt at drawing 30 is shown.

401, 411, and 434 express PC in the 1st home 451, network connection equipment, and a toaster, respectively. 402, 412, 431, 432, and 433 express PC in the 2nd home 452, network connection equipment, a printer, FAX, and message equipment, respectively. In addition, each component other than the network connection equipment in drawing 30 is the same as that of that to which it corresponds in drawing 1.

[0309] It shall be connected with the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452. Termination of the communication line 413 is carried out with network connection equipment 411,412.

[0310] In LAN in a home 451, 1394 buses 421 connect between the contact 411, PC401, and the toaster 434.

[0311] In LAN in a home 452, 1394 buses 422 connect between a contact 412, PC402, a printer 431, a scanner 432, and message equipment 433.

[0312] A network shall be the Internet using Internet Protocol and only PC401,402 and the contact 411,412 shall have an IP address beforehand. Although what was assigned fixed was assigned by protocols, such as DHCP and PPP, whichever is sufficient as an IP address.

[0313] Here, PC401 at a home 451 tries connection with the device of a home 452. PC401 sends the character string which shows a home 452 to network connection equipment 411 by Internet Protocol, for example, a connection request including "Yoshiaki Takahata" who is the name. And network connection equipment 411 has the database with which the telephone number of the home 452 corresponding to "Yoshiaki Takahata" is searched, and makes connection with the contact 412 of a home 452.

[0314] A contact 412 performs authentication of a connecting agency before connection. Connection shall not be made if a permission is not granted at an authentication step. Suppose authentication that the connection of those other than the telephone number registered beforehand at the 2nd home 452 is not accepted for example, using a dispatch telephone number display. If connection is completed, the communication link by Internet Protocol can be performed between homes 451,452.

[0315] However, even if connection is completed from a viewpoint of security protection, it is desirable to operate as the so-called fire wall a contact judges good/failure of passage of a packet to be by the policy of the home. Here, it shall be set up so that all packets may pass beforehand between a home 451 and a home 452 and all actuation can be performed.

[0316] In addition, this connection may be not connection but the IP connection by the telephone.

[0317] Now, PC401 at a home 451 acquires the address of a service management server from the database of a contact 411. The address shall be beforehand registered into the contact 411. Next, PC401 asks a service management server available service. Here, network connection equipment 412 shall serve as a service management server.

[0318] A service management server answers an inquiry and returns the service in the network concerned, and the information on the server. Here, the next service is registered.

[0319] printer:pc2Java The train of ORB:pc2 left expresses the multiplexing identifier (for example, port number) assigned to service the classification of service, and here, and a right train expresses the IP address of PC402 the location of service, and here. Such a service information offer means is known as a service location protocol in the Internet (for example, reference "Internet draft draft-ietf-svrlc-protocol-16.txt").

[0320] These are registered into the host who offers service, and the network connection equipment 412 with which PC402 was beforehand defined here at the time of starting.

[0321] printer expresses the printing service defined by the Internet criterion, and the UDP/TCP number of 515 is assigned. The protocol used here is beforehand prescribed by the Internet criterion.

[0322] Java ORB expresses the service which can use a Java object from the outside. Such service is Java here, although not specified as a criterion yet now. There shall be agreement beforehand about the port number showing ORB.

[0323] Next, how to use through the approach approach 2 1394 proxy object used through the network service standardized by the approach [ two kinds of ] and approach 1 Internet using 1394 equipments of RIMOTO is explained.

[0324] By the approach 1, the printer 431 connected to PC402 by the IEEE1394 interface is used by printer service standardized as Internet Protocol. PC401 has the client of a printer protocol and delivery and a printer are used for PC402 for a printing demand of the format which specified the logic name showing a printer 431 and was standardized in the Internet format. The element of device dependence is not contained in the message which transmits a network by this approach. The application of PC401 only specifies and requires the identifier of the equipment corresponding to printer service and a printer 431, and he is not conscious of the property of equipment.

[0325] Roughly, an approach 2 uses the format that the packet of an IEEE1394 format was encapsulated by the IP packet for the message which transmits a network. PC401 can be used as if the printer 431 was connected

to 1394 local buses.

[0326] Hereafter, it explains in more detail about the above-mentioned approach 2.

[0327] The software structure of the service via a network before connection of a client side is shown in drawing 31, the software structure of the service via a network after connection of a client side is shown in drawing 32, the software structure of the service via a network before the connection by the side of a proxy is shown in drawing 33, and the software structure of the service via a network after the connection by the side of a proxy is shown in drawing 34. In addition, each component other than IP function in drawing 31 - drawing 34 has the same function as that to which it corresponds in drawing 2. The IP functions 504 are many functions of a series of Internet Protocol (TCP/IP protocol sheet), such as TCP/UDP/IP.

[0328] Drawing 31 is the software configuration of the client PC 401 before 1394 stub object generation. The function manager of each hard disk with which a logical device function manager and 502 have in a secondary storage function manager, and 501 has 511,512 to the subordinate of 502, 1394 interface management functions and 513,514 503 Each 1394 interface-management function, unit1,521 in 504 IP function and 434 indicate a toaster and 509 indicates toaster ability to be A 1394 management object, 522 corresponds to a logical device management object, and 531,532,533,534 corresponds to a printer, a scanner, massage equipment, and each unknown logic device-class object. 534-1 is the logical device object of an unknown class. 551 expresses the physical device object corresponding to a toaster 434. 561 expresses the driver object (control program) corresponding to the physical device object 551.

[0329] Drawing 32 is the software configuration of the client PC 401 after 1394 stub object generation, and the 1394 stub object 571, the logical device object 533-1,533-2, the physical device object 551, and the driver object 562,563 are added to the configuration of drawing 31.

[0330] Drawing 33 is a software configuration by the side of [ PC / 402 ] a proxy before 1394 proxy object generation, in each 1394 interface-management function and 431, a printer and 432 express FAX and 433 expresses [ the function manager of each hard disk with which a logical device function manager and 602 have in a secondary storage function manager, and 601 has 611,612 to the subordinate of 602, and 603 / 1394 interface management functions and 613,614 ] massage equipment, respectively. A 1394 management object and 622 621 A logical device management object; The logic device-class object corresponding to a printer, a scanner, FAX, and each unknown device class in 631,632,633,634, 651 and 652,653,654,655, respectively unit1 of a printer (604 in drawing), unit1 (605 in drawing) and unit2 of FAX (606 in drawing), unit1 of massage equipment (607 in drawing), The physical device object corresponding to unit2 (608 in drawing) and 631-1,631-2,632-1,633-1,634-1,634-2 are logical devices which the subordinate of logic device class has, respectively. 661,662,663 expresses the driver object corresponding to the physical device object 651,652,653, respectively.

[0331] Drawing 34 is a software configuration by the side of [ PC / 402 ] a proxy after 1394 proxy object generation, the 1394 proxy object 681, the logic device-class object 635, and the logical device object 635-1,635-2 are added to the configuration of drawing 33, and the logical device object 634-1,634-2 is deleted.

[0332] PC401 specifies the IP address of PC402 of RIMOTO based on service information, and generates the 1394 stub object 571. A 1394 stub object is Java of PC402 of RIMOTO. The class name assigned to the 1394 proxy object is specified as an ORB port, and the generation is required.

[0333] A certain host to another host's Java When using ORB, it judges whether the security manager of a receiving side allows the connection. This shall be automatically performed by the utilization demand of ORB by the object of a transmitting side.

[0334] Here, the ORB utilization demand from PC401 should be received with PC402, in PC402, the 1394 proxy object 681 is generated as a demand, and the reference is returned to the 1394 stub object of PC402. The 1394 stub object 571 performs future demands through the 1394 proxy object 681. In addition, ORB which can use only the method which generates the 1394 proxy object 571 beforehand before PC's402 requiring, and can be started from the object concerned may be assigned to the port considered as 1394 services. This is effective to offer the service limited to 1394.

[0335] If reference is received, the 1394 proxy object 681 will gain the reference to the physical device corresponding to the logical device of an unknown class, and will notify it to the 1394 stub object 571.

[0336] If above reference is gained, the 1394 stub object 571 will register the 1394 management object itself into the 1394 management object 522, and will publish the demand which reconfigurates 1394 devices.

[0337] By this demand, the 1394 management object 522 starts reconstruction by the 1394 proxy object 681, and requires the reference to a physical device object. A 1394 stub object passes the reference 654,655 to the physical object gained from 571 and the 1394 proxy object 681 in order to the 1394 management object 521.

Taking out attribute value from here, the 1394 management object 521 creates the physical device object 552,553 in the same procedure as the case of initialization explained with the 2nd operation gestalt. However, the physical device object (it is hereafter called a stub device object) created here holds the reference to a

remote \*\*\*\*\* physical device object, and it differs in a local physical device object in that the I/O processed as a transaction request to 1394 interfaces is processed as I/O between the 1394 stub objects 571 by the stub device object (in addition, the detail is mentioned later).

[0338] Next, initialization of the logic device-class object 533 by the logical device management object 522 and initialization of the logical device object following it are performed. The stub object 552,553 corresponds to the physical device object 654,655, and agrees in message device class. In PC402 of RIMOTO, since message device class is not used, these equipments are recognized as unknown equipment, but since message device class is registered in local PC401, it is registered as a logical device object 533-1,533-2.

[0339] If an initialization demand is given to the stub object 552 from the logical device object 533-1, the activity demand of the physical device object 654 corresponding to the 1394 proxy object 681 of RIMOTO will be published.

[0340] The 1394 proxy object 681 of RIMOTO generates and registers the logic device-class object 635 of a proxy class. The logical device object 634-1 corresponding to the physical device object 654 is eliminated, the device of a proxy class is built, and it registers as a proxy logical device object 635-1.

[0341] If the proxy logical device object 635-1 is generated, a port number will be assigned between the stub objects 533-1, and a logic connection will be generated. The port used here is Java. ORB is for transmitting 1394 packets using another port.

[0342] A control program is read, the stub object 552 side of local PC401 operates, the physical device object of PC401 of RIMOTO outputs the packet inputted from the port to 1394 interfaces, the packet inputted from 1394 interfaces is only transmitted to a port, and the control program 562 of the stub object 552 performs state control of equipment. However, events, such as bus reset, transmit.

[0343] The same is said of the case where an initialization demand is given to the stub object 553 from the logical device object 533-2.

[0344] The made environment where the physical device of RIMOTO can be used from a local logical device is ready with the above procedure.

[0345] Next, actuation is explained. Here, it explains taking the case of the physical device object 552 of a stub.

[0346] The physical device object 552 receives a processing demand from the logic device driver 531-1, and generates the packet of 1394 formats corresponding to it. The packet of 1394 formats is encapsulated by the IP packet and outputted to said logic connection who secured.

[0347] Here, the direct output of the output from the physical device object 552 is processed through the IP function 504 from a logic connection rather than it is carried out to the IEEE1394 interface 503.

[0348] Here, this may be Ethernet and ATM although the point of the IP function 504 is processed by the IEEE1394 interface. That is, PC without an IEEE1394 interface can also control as if IEEE1394 equipment was connected locally.

[0349] Now, proxy logical device OBUJIEKU 635-1 is reached, the packet of 1394 formats is taken out, and the packet encapsulated by the IP packet is passed to the physical device object 654. Physical device OBUJIEKU 654 outputs this to 1394 interfaces as it is, and acts on the register of equipment 433.

[0350] I/O of the isochronous channel of IEEE1394 cannot be relayed by the above-mentioned approach. It sets to IEEE1394 and he is IEC. An isochronous channel is set up by operating a register by the method defined by 1883.

[0351] The setting-out demand of IEC1883 published by self-equipment from the stub object 552 is transmitted 1394 stub object 571, and the 1394 stub object 571 sets up the connection on the Internet corresponding to an isochronous channel.

[0352] The band to secure can be specified by the isochronous channel of IEEE1394. Since the information is included in the above-mentioned setting-out demand, it is desirable to specify a connection's band with a means, for example, means, such as RSVP, to secure a band on the Internet.

[0353] In addition, although connected with this operation gestalt by the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452 Connection between LAN in a home 451 and LAN in a home 452 is made the Internet like the 1st operation gestalt. In this case, may make it use a global IP address for the IP address of a terminal, and For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node ( drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes.

[0354] In addition, each above function is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0355] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0356] The service provision equipment with which it held in the 2nd home network to the 1st AV contact 4 with the 1st operation gestalt as shown in drawing 12 (4th operation gestalt) (For example, the WWW server, the digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) The case where a service location protocol was used although the information (it is hereafter called service information simply) about the service which a printer 11 offers is notified was shown.

[0357] The 4th operation gestalt explains the case where this is performed with a WWW (World Wide Web) server using a homepage.

[0358] The example of a system configuration in the 4th operation gestalt is the same as that of drawing 1. Here, it considers performing remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) from the 1st AV contact 4 of the 1st domestic network like the 1st operation gestalt.

[0359] Drawing 35 is the thing in the 4th operation gestalt which showed the example of an internal configuration of the 2nd AV contact 5, actuation of each part of 1394 I/F1401, the data link switch 1402, public network I/F1403, the IP processing facility 1404, the FANP processing facility 1405, and the 1394AV command-processing function 1408 is the same as that of the same function part of drawing 2, and a different point is explained. That is, the service location processing facility 27 of drawing 2, and 1394 / IP command conversion function 29 are transposed to the homepage processing facility 1407 and the HTTP/RTSP processing facility 1409 by drawing 35, respectively.

[0360] The 1394/IP service location processing facility 1406 has the function which notifies service information outside if needed, when it has recognized what kind of service the service which the service provision equipment connected to the IEEE1394 bus offers like the 1st operation gestalt is searched, or the registration is received, and what kind of service provision equipment exists on 1394 buses, and is offered and it is required. Moreover, it notifies to the homepage processing facility 1407 which mentions later the service information for every service provision equipment obtained by doing in this way, and creation of the homepage which displays the situation of the 2nd domestic network is urged.

[0361] The homepage processing facility 1407 has WWW server ability. From the 1394-/IP service location processing facility 1406, reception and it are summarized for the service information on the 2nd domestic network as a homepage. For example, the icon and character string showing each service provision equipment are arranged on a homepage. And it is made to link to the icon and character string showing each service provision equipment on the homepage corresponding to each for the command for carrying out remote control of each service provision equipment. Thus, when the created homepage has access through a public network 2, the homepage demanded if needed is transmitted or the command for remote control received through the public network 2 is transmitted to the HTTP/RTSP processing facility 1409. It mentions later for details.

[0362] Here, with the command for carrying out remote control of the service provision equipment, it is suitable for HTTP or RTSP (protocol for operating the real-time media in a WWW server by remote control). The command for remote control which was suitable for the HTTP command and RTSP in the command for remote control suitable for HTTP is called the RTSP command.

[0363] The HTTP/RTSP processing facility 1409 has the HTTP demon or the RTSP demon inside. With the function to perform processing to the HTTP command or the RTSP command transmitted from the homepage processing facility 1407 In being what is assigned to the service which the 2nd AV contact 5 serves as a deputy, and the destination of the command exhibits It is changed into an IEEE1394 command if needed, and it also has the function (deputy processing) which controls the device on 1394 buses 3 through the 1394AV command-processing function 1408.

[0364] Next, in the 2nd domestic network, the procedure which acquires the service information on each service provision equipment that the 2nd AV contact 5 was connected to the 2nd domestic network is explained. This is the same as that of the 1st operation gestalt. That is, as shown in drawing 3, the 2nd AV contact 5 is with reading the configuration memory of the connected device (the DVD player 8, digital VTR 9, PC10, printer 11), and using a service location protocol, as shown in drawing 9, and acquires the service information on the service provision equipment connected to the 2nd domestic network.

[0365] In addition, the information included in configuration memory may have drawing 4, drawing 5, and a thing like drawing 6. Moreover, service information may be registered in the format shown in drawing 10.

[0366] Now, the 2nd AV contact 5 recognizes the DVD player 8, digital VTR 9, PC10, and a printer 11 as 1394 nodes through reading of configuration memory at this event. Moreover, each of WWW service, digital album service, Aircon Service, and microwave oven service is further recognized through a service location protocol.



Here, it is recognized as it being the service which is provided with the 2nd AV contact 5 and provided with Aircon Service and microwave oven service with PC10.

[0367] Now, the 2nd AV contact 5 creates the homepage "introduces what there is in that house (what kind of service [ what kind of service provision equipment and ] exist?)" based on these collected service information.

[0368] The homepage created enumerates icons, character strings, etc. showing them for every service provision [ to make it recognize / a user ] equipment, as shown in drawing 36 R> 6. This homepage may build this so that it can reach by the hyperlink from an icon in a saying in the first homepage which the WWW server of that house introduces by the default, for example (for example, "the electrical machinery and apparatus of my home") character string. Incidentally, in case it moves to the homepage of this "electrical machinery and apparatus of my home", passing through a certain authentication procedure is desirable so that it may not be invaded by others who have not got authorization.

[0369] When the icon in a homepage as shown in drawing 36 , and a character string are clicked, it is made for the service provision equipment corresponding to it or the homepage for every service to appear. For example, you may make it a click of the icon of the DVD player of drawing 36 display "the homepage of a DVD player" as shown in drawing 39 linked to it.

[0370] In order to create a homepage as shown in drawing 36 of such a configuration, the homepage processing facility 1407 completes a procedure as shown in the flow chart of drawing 37 .

[0371] First, it reads one [ at a time ] the service information registered into 1394 / IP service location processing facility 1406 for example, for every service provision equipment, and the homepage (for example, "homepage of a DVD player" as shown in drawing 39 ) for every service provision equipment is created (step S101 - step S102).

[0372] The flow chart shown in drawing 38 shows the homepage creation procedure for every service provision equipment of step S102.

[0373] With reference to the table 1410 (refer to drawing 50 ) corresponding to a RTSP command for every service provision equipment provided in 1394 / IP service location processing facility 1406, the command group (command group for control of the service provision equipment which lets a homepage pass and is opened to a user) as which each service provision equipment was determined beforehand is acquired (step S111), and the icon or character string corresponding to it is created for every command (step S112). For example, when service provision equipment is a DVD player, the RTSP command "PLAY" for directing "playback" is acquired from the table corresponding to a RTSP command of drawing 50 R> 0, and the icon (icon i206 of drawing 39 ) corresponding to the command is created.

[0374] As for the table 1410 corresponding to a RTSP command, the RTSP command is described for every service provision equipment. For example, in the case of the DVD player 8, as a command group, each RTSP command of power-source ON, power-source OFF, playback, rewinding, front music, a rapid traverse, the following music, a halt, and a halt is mentioned. Moreover, the case of the DVD player 8 which is performing deputy processing with the 2nd AV contact 5, and digital VTR 9 is having both 1394 commands corresponding to each RTSP command memorized as shown in drawing 50 .

[0375] In addition, the table 1410 corresponding to a RTSP command may be the same as the table provided in 1394 / IP command conversion function 1423 of drawing 42 mentioned later.

[0376] Now, the RTSP command of the service provision equipment is matched with the icon or character string created at step S112 (step S113). For example, the RTSP command "PLAY" is made to correspond to the icon i206 of "playback" of drawing 39 . For example, an icon or a character string, and the RTSP command corresponding to it may be registered into a table.

[0377] in addition, the case of the DVD player 8 which is performing deputy processing with the 2nd AV contact 5, and digital VTR 9 -- the address of the 2nd AV contact 5, the DVD player 8, and digital VTR 9 -- the port number assigned to each IEEE1394 node is included in the RTSP command.

[0378] The homepage of service provision equipment as performed the above to all the commands that the service provision equipment offers, and arranged the created icon or character string suitably, for example, shown in drawing 39 is created (step S114 - step S115).

[0379] Next, the icon or character string of the service provision equipment with the hyperlink to the homepage for every service provision equipment created by explanation of drawing 37 according to the flow chart of return and drawing 38 is created or acquired (step S103). That is, the icon for every service provision equipment etc. may be taken out from the configuration memory of that service provision equipment, and may come to hand in the form which goes for URL which can be specified as a meaning to be offered by the service location protocol, and to take the location of this icon with it there.

[0380] The icon obtained at step S103 is stuck on the homepage of "the electrical machinery and apparatus of my home." It holds in the 2nd domestic network, the above procedure is performed about the service provision



equipment of all \*\*\*\*\*, and a homepage like drawing 36 can create it (step S104).

[0381] Now, if it clicks on the icon i101 which expresses a DVD player among the icon showing the service provision equipment on the homepage shown in drawing 36, or a character string, the homepage of the service provision equipment matched with this icon, i.e., the homepage of a DVD player as shown in drawing 39, will appear.

[0382] The homepage of a DVD player can be used as a control panel of a DVD player in the homepage of service provision equipment as shown in drawing 39, i.e., this case, and a user can do remote control of the DVD player 8. For example, when a "power-source ON" carbon button is clicked, it is condition that the power source of the DVD player 8 is turned on.

[0383] Next, it explains with reference to the sequence diagram showing the processing actuation in the case of carrying out remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10), through the 1st AV contact 4 and a public network 2 from PC6 of the 1st domestic network in drawing 4040, for example.

[0384] Suppose that the homepage as shown in drawing 36 was shown by using a predetermined WWW browser with PC6 held in the 1st domestic network. The HTTP message as which he will demand the homepage of the DVD player by which the response price was carried out to it if a user clicks on the icon of the DVD player i101 is outputted from PC6.

[0385] In response to this message, the sending-out demand of the homepage of DVD is performed to the 2nd AV contact 5 with the 1st AV contact 4 (step S4501). For example, the message "GET/appliances/dvd.html HTTP/1.1" is transmitted to the 2nd AV contact 5 from the 1st AV contact 4.

[0386] In response, the 2nd AV contact 5 sends the text (refer to drawing 41) of the homepage of a DVD player as shown by drawing 39 to the 1st AV contact 4 (step S4502).

[0387] As shown in drawing 41, the hyperlink given to the "reproductive" icon i206 is the "PLAY" command of RTSP for directing playback, and the node used as the connection place, in the case of this operation gestalt the IP address of the 2nd AV contact 5, i.e., "192.168.1.254", and its port number (in the case of this operation gestalt "2000") are added. If it clicks on the "reproductive" icon i206 by doing in this way, a user can send out the "PLAY" command of RTSP to the port of a request of a desired node, without caring about the address of a transmission place. It can have and remote control using RTSP can be performed now through correlation of a hyperlink.

[0388] Now, the user of 1st AV contact can start remote operation of a DVD player, if the homepage of DVD is received. For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4503). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport : It is with rtp/udp;port=5500" and command data are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4504). With this command data, the 1st AV control device 4 transmitted data using each protocol of RTP/UDP, and is requiring that the port number of a receiving side should use "5500."

[0389] Actuation of the 2nd AV contact 5 which received this is explained below. The example of an internal configuration of HTTP / RTSP processing facility 1409 of 2nd AV contact is shown in drawing 42. The "SETUP" command data of Above RTSP reach the HTTP/RTSP main processing facility 1421. Here, first, among "SETUP" command data, it recognizes that a port number "2000" is a port number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0390] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4505).

[0391] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4506). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below.

[0392] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4507). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number

"2000", session number "1234") matched by this hyperlink (step S4508).

[0393] It executes the "PLAY" command to reservation (step S4509) of the synchronous channel by IEC1883, and the DVD player 8 of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this (step S4510), and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it. And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session:1234") of RTSP to the 1st AV contact 4 (step S4511 - step S4512).

[0394] Then, the 2nd AV contact 5 carries out IP capsulation of the image data sent through this synchronous channel, and sends them out to the 1st AV contact 4 as an IP packet (step S 4513-4515).

[0395] The 1st AV contact 4 receives the above-mentioned image data as an IP packet, and performs required processings, such as a display of an image. When making the sending-out place of an image digital [ TV / 7 ] Reservation of the required synchronous channel on IEEE1394 which is the 1st domestic network, and the 1st AV contact 4 receive digital [ 7 ] one TV like the 1st operation gestalt. What is necessary is just to send out to the 1st domestic network, after directing a display on the screen of the data reception and its data from this synchronous channel and changing the above-mentioned image data into ejection and the format for IEEE1394 from a receiving IP packet.

[0396] In addition, even when the user clicks on the "reproductive" icon i206 before clicking on the icon i201 of the "power source ON" of the homepage of drawing 39, the user judges that there is volition of actuation of the DVD player 8, and sends out both the "SETUP" command and the "PLAY" command in response to the click of the "reproductive" icon i206.

[0397] Moreover, when opening the homepage of a DVD player, the "SETUP" command of a DVD player is sent out as a RTSP command.

[0398] It is based on the service information collected from all the service provision equipments in which remote control held in the 2nd domestic network is possible as explained above. The 2nd AV contact 5 With reference to the table 1410 corresponding to a RTSP command, the RTSP command of each service provision equipment and the homepage which carries the linked icon are created. When it clicks on a desired icon by the 1st AV contact 4 side which accessed this homepage, The RTSP (it registers with table of 1394-/IP command conversion function 1423 of HTTP/RTSP processing facility 1409) command matched with the icon by the hyperlink By being changed into 1394AV(s) / C-command, and performing desired control to desired service provision equipment Remote control will become possible even when the service provision equipment (for example, DVD player 8) connected to the 2nd physical network (for example, IEEE1394 bus 3) can interpret only the protocol depending on a data link layer (if AV contact of this invention is used).

[0399] Now, the above explained the case where the 2nd AV contact 5 encapsulated and sent out image data to an IP packet. On the other hand, the 2nd AV contact 5 does not perform IP capsulation, but how to send out image data to the 1st AV contact 4 with non-IP data is also considered. In this case, it explains with reference to the sequence which is attached and is shown in drawing 43.

[0400] The user of the 1st AV contact 4 of step S4801 - step S4802 is the same as that of explanation of drawing 40 until he begins remote operation of reception and a DVD player for the homepage of a DVD player.

[0401] For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4803). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport : The "SETUP" command data of RTSP called iec1883 / nonip;port=FANP" are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4804). It is being required that the 1st AV control device 4 should encapsulate data in IEC1883, and should transmit them with this command data in the form which is not an IP packet (the information of "iec1883/nonip" for directing non-IP packet-ization is included in [SETUP [ namely, ]" command of RTSP). Moreover, in order to know the link layer information and attribute information on the data transmitted, it is being required from the 2nd AV contact 5 that the above-mentioned information should be notified to the 1st AV contact 4 using FANP.

[0402] The "SETUP" command data of RTSP are received by the HTTP/RTSP processing facility 1409 of the 2nd AV contact 5, and reach the HTTP/RTSP main processing facility 1421.

[0403] In the HTTP/RTSP main processing facility 1421, it recognizes that a port number "2000" is a number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0404] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-

processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4805).

[0405] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4806). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below. The session number which a browser holds is updated by reference of the hyperlink corresponding to termination of the explicit session by the user, for example, session termination, termination of the session by the 2nd AV contact 5 of the pair opposite side, or reloading of a page.

[0406] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4807). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number "2000", session number "1234") matched by this hyperlink (step S4808).

[0407] It executes the "PLAY" command to reservation (#X) of the synchronous channel by IEC1883, and the DVD player of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this, and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it (steps S4809-S4811). And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session: 1234") of RTSP to the 1st AV contact 4 (step S4811 - step S4812).

[0408] Then, IP capsulation does not perform the image data sent through this synchronous channel (#X), but the 2nd AV contact 5 encapsulates a public network as it is, and sends it out to the 1st AV contact 4. For example, as long as a public network is an ATM network, IEC1883 packet transmitted to the 2nd AV contact 5 may be mapped and sent out to an ATM network as it is, IEC1883 packet may be removed once, and the image data itself may be mapped and sent out to an ATM network. make it any -- in order to notify the header information of the link layer which the 2nd AV contact 5 sends out to the 1st AV contact 4, a FANP message "FANP message (ch: #y, Session:1234)" is sent out (step S4813).

[0409] In order to clarify that how to use a FANP message is FANP corresponding to the session number notified in step S4812 although it is the same as that of the 1st operation gestalt fundamentally, the session number (in the case of this operation gestalt "1234") of the same value as the value notified at step S4812 may be contained in this FANP message. By making it this appearance, the receiving-side node 4, i.e., 1st AV contact, can recognize that a FANP message is a thing corresponding to the "PLAY" command of said RTSP.

[0410] Now, if the image data sent by the synchronous channel (#X) from the DVD player 8 are outputted to a public network 2 in the 2nd AV contact 5, without carrying out IP capsulation, required processings, such as a display of an image, will be performed in the 1st AV contact 4 which received it (steps S4814-S4816). As it is in step S4815 in that case, MPEGover1394 to MPEGoverATM etc. may perform required format conversion, when the data transmission approach depending on the network transmitted is specified. Moreover, when making the sending-out place of an image digital [ TV / 7 ], it is also the same as that of the above-mentioned case.

[0411] Although the above operation gestalt [ 4th ] has explained the case where the RTSP command for carrying out remote control of the service provision equipment to the icon or character string in a homepage is made to correspond in a hyperlink To the icon in the homepage corresponding to each RTSP command, or each of a character string, instead of making it correspond in a hyperlink When the program (for example, JAVA (trademark) program) for creating corresponding RTSP command data is stuck and the icon or character string is clicked The RTSP command which starts this program with the 1st AV contact 4 (for example, JAVA virtual machine on the 1st AV contact 4), and was explained by drawing 40 or drawing 43 is sent out.

[0412] The processing actuation in this case is the same as that of drawing 40 and drawing 43, and text description of the homepage of the service provision equipment transmitted from the 2nd AV contact 5 at step S4504 of drawing 40 and step S4802 of drawing 43 differs.

[0413] An example of the text of the homepage of service provision equipment is shown in drawing 44. The program which is the text of the homepage of a DVD player, for example, generates the RTSP command to the icon i206 of "playback" of drawing 39 is added to drawing 44.

[0414] Too, if it clicks on the "reproductive" icon i206 also in this case, by starting the program which generates the "PLAY" command of RTSP, that command can be sent out now to the port of a request of a desired node, it can have it in it, and remote control of the service provision equipment using RTSP can be carried out.

[0415] Next, the icon (carbon button) i210 of "detail setting out" of the homepage of drawing 39 is explained. This carbon button is used to perform actuation finer than remote control beforehand defined by the RTSP command to target service provision equipment (for example, DVD player 8). That is, the control command of the DVD player 8 specified with the AV/C protocol of IEEE1394 may be various from the command specified by RTSP. Thus, if the homepage which performs this is separately set up as a cure in the case of the ability to respond to no commands of 1394 AV/C by the RTSP command and the carbon button of "detail setting out" of drawing 39 is pushed, it was matched with it, for example, the command "GET /appliances/dvd\_detail.html HTTP/1.1" will be sent out and the homepage for detail setting out of a DVD player as shown in drawing 47 will be sent.

[0416] Drawing 45 shows the creation procedure of the homepage for detail setting out of service provision equipment. That is, the table corresponding to the native command which registered the command (native command) depending on the link layer method (AV/C protocol of IEEE1394 when it is this operation gestalt) of the service provision equipment on which the response is not made on the command table 1410 for every above-mentioned service provision equipment is separately provided in 1394 / IP service location processing facility 1406. With reference to a native command table, a native command is acquired for every service provision equipment (step S121), and the icon or character string corresponding to it is created for every command (step S122). A CGI (Common Gateway Interface) script is matched with the generated icon or character string (step S123). The homepage for detail setting out of service provision equipment as performed the above to all the native commands of the service provision equipment, and arranged the created icon or character string suitably, for example, shown in drawing 47 is created (step S124 - step S125).

[0417] In addition, the table corresponding to a native command may be the same as the table in the CGI processing facility 1424 provided in the HTTP/RTSP processing facility shown in drawing 42.

[0418] Some carbon buttons (an icon or character string) arranged at the homepage for detail setting out of the DVD player of drawing 47 are matched with the CGI script processed by the CGI (Common Gateway Interface) processing facility in the 2nd AV contact 5. And each CGI script is the script which sends out AV/C-command of corresponding IEEE1394 to the IEEE1394 bus of the 2nd domestic network, and it has, and if the above-mentioned icon or a character string is clicked, grain size defined with the AV/C protocol can be controlled.

[0419] Thus, if the homepage for detail setting out is created and the icon or character string in the homepage is clicked, the demand message for starting the CGI script in the 2nd AV contact 5 which swerved, and was been and matched is transmitted in HTTP, in response to it, with the 2nd AV contact 5, this CGI script will be started and a corresponding AV/C command will be published.

[0420] the thing to which drawing 46 is transmitted from the 2nd AV contact 5 and which showed an example of text description of the homepage for detail setting out of a DVD player, for example -- it is -- the character string of "slow playback" of drawing 47 -- a CGI script -- a response -- the price -- the \*\*\*\*\* case is shown.

[0421] Although the RTSP command will be published like step S4508 of the above-mentioned drawing 40 if it chooses "usually reproducing" by the homepage for detail setting out of the DVD player of drawing 47 About the command which is not supported by RTSP, such as "language selection" and "slow playback" In the CGI processing facility 1424 provided in HTTP / RSTP processing facility of the 2nd AV contact 5, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0422] For example, when "slow playback" is chosen by the homepage shown in drawing 47, the message "dvd/slowplay.cgi HTTP [ GET http://192.168.1.254/]1.1" for starting the CGI script corresponding to this is turned and sent out to the 2nd AV contact 5. In the 2nd AV contact 5 which received this, since the command of "slow playback" is not supported by RTSP, in the CGI processing facility 1424 provided in a HTTP/RSTP processing facility, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0423] It is easy to be natural, even if the icon or character string corresponding to the RTSP command, and the icon or character string corresponding to a CGI script may be intermingled in the homepage for detail setting out of service provision equipment and the homepage consists of only the icons or character strings corresponding to a CGI script. For example, "playback" carbon button of drawing 47, the carbon button of "a power source ON" and "a power source OFF", etc. may be realized by a JAVA program etc. in the hyperlink about the command in the table corresponding to a RTSP command, and you may realize in CGI about other detail commands, such as "selection language" and a "title".

[0424] moreover, all the carbon buttons arranged at the homepage for detail setting out of drawing 47 are registered into the table corresponding to a native command -- having -- \*\*\*\* -- a CGI script -- a response -- the price -- \*\*\*\*\* -- it is good.

[0425] As mentioned above, although the 4th operation gestalt has described remote control of the AV equipment according to the AV/C command on an IEEE1394 bus, same control can be similarly performed about the device which has a protocol group depending on the link layer of other arbitration. The case where LON which is a kind of a home automation network is applied as the example is explained.

[0426] Drawing 48 and drawing 49 show the example of an internal configuration of AV contact which connects LON, respectively, and the example of a configuration of a HTTP/RTSP processing facility.

[0427] the point which can send out now command groups, such as the command group defined by LON, for example, LONTalk etc., instead of the AV/C command of IEEE1394 -- difference -- it is a point and each other configuration sections are the same as that of the above-mentioned.

[0428] In addition, each function explained with the 4th operation gestalt above is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0429] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0430] (5th operation gestalt) Drawing 51 is what showed the example of a configuration of the communication system concerning the 5th operation gestalt of this invention, and the 1st network (for example, home network which consists of IEEE1394 buses) 2010 and 2nd network (for example, Internet on a public network 2101) interconnect through the AV contact 2201. Hereafter, the 1st network 2010 is called a home network 2010, and the 2nd network 2101 is called the Internet 2101. Moreover, each terminal unit connected to the home network 2010 presupposes that it is an information appliance with the Internet processing facility.

[0431] The AV contact 2201 has the role of the Gateway which connects a home network 2010 and the Internet 2101, and it has the termination function of a home network or the Internet, router ability, a protocol conversion function, deputy server ability, etc. so that it may mention later.

[0432] The personal computer (PC) 2001, the printer 2002, and the DVD player 2003 are connected to the IEEE1394 bus which constitutes a home network 2010. The IP terminal 2102 which can perform IP communication link is connected to the Internet 2101. Of course, terminal units other than the above may be connected to a home network 2010 and the Internet 2101.

[0433] In drawing 51, all terminal units are terminal units which can have an Internet terminal, i.e., an IP address, and can perform IP communication link. However, the IEEE1394 bus which constitutes a home network 2010 is employed in the address of private IP address space, and the Internet 2102 is employed in global IP address (for example, IPv4) space. The IP address of the IP terminal 2101 presupposes that it is "G. 2." On the other hand, as the address of each equipment on a home network 2010, it has the private subnet address "P. 0", and PC2001 presupposes that "P. 1" and a printer 2002 are [ "P. 2" and the DVD player 2003 ] "P. 3."

[0434] Since it connects with these [ from which an address system differs ] two networks, the AV contact 2201 has the address of two different address systems. That is, the IP address by the side of a home network 2010 presupposes that the IP address by the side of the Internet 2101 is "G. 1" by "P. 254."

[0435] Drawing 52 shows the example of a configuration of the AV contact 2201. The AV contact 2201 A home network 2010 The Internet interface 2205 which manages the interface for accessing 1394 interfaces (I/F) 2202 and the Internet 2101 which manage the interface for connecting with the IEEE1394 bus to constitute (I/F), The service in IP processing section 2202 which performs routing processing of the Internet packet, address translation between a global IP address and a private IP address, etc., and a home network 2010 is detected. The equipment on the service location deputy processing section 2203 which collects and presents these services through the homepage processing section 2204 to the Internet 2101 side (advertisement), and a home network 2010, About service, the homepage which can perform remote control from the Internet 2101 side is generated, and it consists of the homepage processing sections 2204 which deliver this according to a demand.

[0436] IP processing section 2202 possesses the NAT processing section 2206 which performs address translation processing. NAT is the abbreviation for network address translation (translation), and, generally transform processing between a global IP address and a private IP address or transform processing of the IPv4 address and the IPv6 address is performed. For details, please refer to RFC1631.

[0437] The NAT processing section 2206 also has the address translation function of the port unit called an IP masquerade. Namely, even if many terminal units are in a home network 2010 side It is the technique which will be made enough if there is one global IP address (G. "1" when it is this operation gestalt) required for the Internet 2101 side. Specifically Each terminal unit connected to the home network 2101, As opposed to the logic multiplex identifier (the logic multiplex identifier of the service identified in the port number specified by RFC1340 is a port number) of each service (for example, service identified in the port number specified by RFC1340) Other separate logic multiplex identifiers (for example, port number specified by RFC1340) are assigned for every service with the same global IP address "G. 1." It memorizes as a table (address port

number translation table 2207) as shows these response relation to drawing 55 . And the communication link of the terminal unit on the Internet 2101 and the equipment on a home network 2010 is mutually attained by changing into the address and the port number of a mutual address space the destination address of the packet transmitted to another side from either the Internet 2101 and the home network 2010 using this table 2207, and being transmitted.

[0438] IP processing section 2202 possesses a packet filter 2208 further. A packet filter 2208 has a function as the so-called firewall. That is, as the packet (or packet which may pass) which should pass the AV contact 2201 and which does not come out is distinguished and this is not passed to other parts other than IP processing section 2202 about the packet which should pass and which does not come out (for example, it discards), access to a home network 2010 from the outside is restricted. This prevents beforehand access to the service on the home network 2010 by the malicious user. For this decision processing, a packet filter 2208 has the table (packet filter table 2209) which passed the AV contact 2201 and registered the source address of the packet which can be sent out to a home network 2010, and when the source address of the packet inputted from the Internet 2101 is registered into this table, it permits that passage. In addition, the source address which does not pass the AV contact 2201 may be registered into the packet filter table 2209. In this case, if the source address of the packet inputted from the Internet 2101 is not registered into this table, it permits passage of that packet.

[0439] Next, the case where access a home network 2010, for example, the DVD player 2003 is operated by remote control from the IP terminal 2102 on the Internet 2101 with reference to the sequence shown in drawing 53 is taken for an example, and processing actuation, of the AV contact 2201 is explained.

[0440] First, the service location deputy processing section 2203 of the AV contact 2201 collects the service location information on a home network 2010 (step S5001 - step S5003). Service location information is information which shows what kind of service or terminal unit exists on a home network 2010. Some approaches can be considered as an approach of collecting service location information. For example, although various approaches, such as an approach using a service location protocol, an approach using LDAP (lightweight directory access protocol), an approach using DHCP (dynamic host configuration protocol), and an approach using MIB (management information base) of SNMP (simple network-control protocol), can be considered, which these approaches may be used.

[0441] Here, the service location information on a home network 2010 shall be collected, for example using a service location protocol as shown in drawing 12 . In addition, refer to RFC2165 for the detail of a service location protocol. Like drawing 53 , the AV contact 2201 serves as a directory agent of a home network 2010, and collection of actual service location information may register each service to the AV contact 2201 from each service agent (namely, PC2001, a printer 2002, the DVD player 2003).

[0442] In addition, the AV contact 2201 sends out a service request to IP multicast address beforehand assigned to each service about the service which can support the AV contact 2201 besides such an approach, and you may make it the terminal unit itself which offers the service concerned answer to this demand. Moreover, you may make it ask the directory agent the AV contact 2210 recognizes [ an agent ] separate existence on a home network 2010 the detail of service on a home network 2010.

[0443] Based on the information (port number of the service specifically offered by the address and the equipment concerned of a terminal unit on a home network 2010 (RFC1340 prescribes)) about the service currently offered on the home network 2010 collected here, processing actuation as shown in the flow chart of drawing 54 is performed.

[0444] The AV contact 2201 creates the homepage explaining what kind of service and terminal unit exist in owner (for example, referred to as Mr. A) \*\* of a home network 2010 in the homepage processing section 2204 (step S5101 - step S5102).

[0445] This homepage is a homepage displayed to access URL (Uniform Resource Locator), "http://G.1", of A Mr. \*\* from the terminal unit of the arbitration on the Internet 2101 as shows drawing 59 . [ i.e., ] It is the user interface which can operate each service which exists in A Mr. \*\*, and a terminal unit by the CGI (Common Gate Way) program from this homepage, for example. If the link is stretched to each terminal unit on a home network 2010 and that object is actually clicked from this homepage, next it connects with the homepage of each terminal unit, and has become the structure as which the homepage which becomes possible [ operating the actuation switch of that terminal unit which each terminal unit offers by remote control ] is displayed.

[0446] Next, the service location deputy processing section 2203 assigns the port number (well not a NOUN port number but the port number which can be set up dynamically) specified by the original logic multiplex identifier 1340, i.e., RFC, about each of the service collected previously or a terminal unit (step S5104). It sets from the first on a home network 2010, and a \*\*\*\*\* port number calls the port number to which it sets from the first on a home network 2010 and to which a \*\*\*\*\* port number is hereafter assigned uniquely

in the service location deputy processing section 2203 to the service on the 1st port number, a call, and a home network 2010 the 2nd port number, in order to distinguish.

[0447] For example, the 2nd port number "2000" is assigned so that the 2nd port number "2002" may tell it a printer 2002 and the 2nd port number "2004" may tell PC2001 to the DVD player 2003. This 2nd port number becomes the global IP address and group of the AV contact 2201, and is employed. That is, from the Internet 2101 side, when the 2nd port number "2000" is accessed, this will interpret the AV contact 2201 as it being access to the DVD player 2003. In addition, if a logic multiplex identifier is an identifier which can identify on the Internet each service offered not only the port number specified by RFC1340 but on a home network 2010, it is good anything.

[0448] The response relation between the global unique IP address of the AV contact 2201, the 2nd port number assigned to each service offered on a home network 2010, the 1st port number as a logic multiplex identifier to the service concerned on a home network 2010, and the private IP address of equipment which offers the service concerned is registered into the table 2207 corresponding to an address port number (step S5105).

[0449] The example of the table 2207 corresponding to an address port number is shown in drawing 55. The IP address by the side of the Internet 2101 (global unique IP address), the IP address by the side of the 2nd port number and a home network 2010 (private IP address), and the pair of the 1st port number are registered into the table 2207 corresponding to an address port number for each [ are provided on a home network 2010 ] the service of every. Sequential registration of the response relation about all services with which this table 2207 is provided on a home network 2010 is carried out.

[0450] For example, in the case of the DVD player 2003, to the Internet 2101 side, the 2nd port number "2000" is assigned to service (IP address (private IP address) = P.3, the 1st port number = interpreted as it being the http service offered by the DVD player by 80 by the service location protocol) of the DVD player within a home network 2010 by the global IP address "G. 1" of the AV contact 2201.

[0451] Creation of such an address port number translation table 2207 is performed about each of service of A Mr. \*\*. About this each, description to the homepage of A Mr. \*\* is performed.

[0452] About all services of A Mr. \*\*, after the registration to a table 2207 finishes, creation of the address port number translation table 2207 and creation of the homepage of A Mr. \*\* are completed (step S5106).

[0453] Now, the created address port number translation table 2207 is used in case an IP packet passes through the inside of the AV contact 2201, and an IP address and transform processing of a port number are performed. With reference to drawing 58, transform processing of the IP address and port number using the address port number translation table 2207 is explained concretely. For example, by referring to a table 2207, an IP packet [ as / the Internet 2101 side to whose destination IP address is "G. 1" / whose destination port number is "2000" ] is changed into an IP packet [ as / whose destination IP address is "P. 3" / whose destination port number is "80" ], and is sent out to a home network 2010 side. On the contrary, a transmitting agency IP address is changed into an IP packet [ as / "G. 1" and whose transmitting agency port number are "2000" ], and, as for an IP packet [ as / "P. 3" and whose transmitting agency port number are "80" ], a home network 110 side to a transmitting agency IP address is sent out to the Internet 2101.

[0454] Now, such an address port number translation table 2207 and the AV contact 2201 which ended creation of the homepage of A Mr. \*\* exhibit this homepage on the Internet 2101 as a homepage of A Mr. \*\* (refer to drawing 59).

[0455] Next, the user of the IP terminal 2102 on the Internet 2101 explains the case where the DVD player 2003 of A Mr. \*\* is operated by remote control.

[0456] Processing actuation of the AV contact 2201 at the time of receiving an IP packet for processing actuation of the AV contact 2210 at the time of receiving an IP packet from the Internet 2101 side from a home network 2010 side to drawing 56 is shown in drawing 57. Hereafter, it explains with reference to the flow chart shown in drawing 53, drawing 56 - drawing 57.

[0457] First, the IP terminal 2102 performs authentication procedure in order to require sending of the homepage of A Mr. \*\* from the AV contact 2201 (step S5004 of drawing 53). For example, to the user of the IP terminal 2102, a password input etc. is required and the IP address of the IP terminal 2102 is registered into the above-mentioned packet filter table 2209 only about the user attested by this.

[0458] Access only of the IP address which the packet filter table 2209 is a table of only having only enumerated IP addresses, and is registered into this table to the service offered on a home network 2010 and a home network 2010 is attained.

[0459] Next, the IP terminal 2102 requires sending of the homepage of A Mr. \*\* from the AV contact 104 (step S5005). It checks (step S5006), when the source address concerned is registered into the packet filter table 2209, it restricts whether the source address of the packet of a sending demand of the homepage concerned is



registered into the packet filter table 2209 by the packet filter 2208, and the packet concerned is passed to the homepage processing section 2204, and the homepage processing section 2204 sends the homepage of A Mr. \*\* to the IP terminal 2102 according to the demand concerned (step S5007).

[0460] As shown in drawing 59 R> 9, the link to each homepage of the DVD player 2003 on a home network 2010, a printer 2002, and PC2001 is attached to the homepage sent here. For example, it is linked to the alphabetic character or picture on the homepage of drawing 59 a "DVD player" to the DVD player 2003. The address of a actual link place serves as the 2nd port number "2000" of the global IP address "G. 1" of the AV contact 2201, and the format top serves as a deputy server for the AV contact 2201 to access to the equipment on a home network 2010. Of course, this is not recognized from the IP terminal 2102. However, the processing which the AV contact 2201 performs actually unlike deputy server processing is IP masquerade processing, i.e., an IP address and transform processing of a port number, like the after-mentioned.

[0461] Now, the user of the IP terminal 2102 sends out the sending-out demand of the homepage of a DVD player so that he may operate the DVD player 2003 by remote control. For example, the IP packet of a sending-out demand of the homepage of a DVD player is sent out by clicking the alphabetic character or picture on the homepage shown in drawing 59 a "DVD player." A destination IP address is [ "G. 1" and the destination port number of the destination of this packet ] "2000" (step S5008).

[0462] This IP packet is explained with reference to the flow chart shown in drawing 56 about packet filtering and address port number transform processing to the processing actuation S5009, i.e., the step of drawing 53 , when the AV contact 2201 receives - step S5010.

[0463] The AV contact 2201 will perform packet-filtering processing with reference to the packet filter table 2209 first, if it checks that it is addressing to itself with reference to the destination address of the IP packet which received (step S5201) (step S5202). If the source address of the packet concerned is registered into the packet filter table 2209 next, it will be confirmed whether the group of the destination IP address of the packet concerned and a destination port number is registered into the address port number translation table 2207 (step S5203). If registered, according to the address port number translation table 2207, the destination IP address concerned and a destination port number are substituted for the IP address (private IP address) and the 1st port number by the side of a corresponding home network (step S5204), and the IP packet concerned is sent out to a home network 2010 (step S5205). Thus, address translation from a global IP address and the 2nd port number to a private address and the 1st port number is performed.

[0464] In addition, it does not register with the address port number translation table 2207, and the packet is discarded when it is not a packet addressed to AV contact 2201 itself (step S5206).

[0465] The IP packet which return and address port number transform processing (IP masquerade processing) were performed to explanation of drawing 53 , and was sent out to the home network 2010 side reaches the DVD player 2003 (step S5011), and the DVD player 2003 sends the homepage of the DVD player 2003 by making the global IP address of the IP terminal 2102 into a destination address. A private IP address "P. 3" and the transmitting agency port number of the transmitting agency IP address of the IP packet in that case are the 1st port number "80" (step S5012).

[0466] The IP packet containing the homepage of the DVD player 2003 is explained about processing actuation of the AV contact 2201 when receiving from a home network 2010 side, i.e., address port number transform-processing actuation of step S5013 of drawing 53 , with reference to the flow chart shown in drawing 57 .

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[Translation done.]

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to the communications control approach performed by a communication device and these communication devices, such as a computer which may control communication devices, such as a computer equipped with the function which controls remote operation of the directory service in a home network environment, and a device, or a peripheral device, especially the various equipments connected to the general-purpose bus, the service registration approach, the service provision approach, and the device control program registration approach.

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PRIOR ART

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[Description of the Prior Art] (1) Digitization of electronic equipment is advancing quickly so that development of a multimedia technique may be symbolic in recent years. This inclination has started in office environment first. In the field of hardware, it is going on in the form of installation of a personal computer, digitizations of OA equipment, and those networks. In the field of software, the Internet applications, such as software, such as basic business (rightsizing of this is carried out and it is shifting to a personal computer etc.) by the host, and a word processor, a spreadsheet, or WWW, etc. are introduced. And Field of application of digitization is circulated increasingly and the development does not know the place which remains.

[0003] The above-mentioned inclination is seen also in the device used by domestic, its related field, etc. That is, digitizations, such as installation of Internet accesses, such as digitizations (namely, DVD, digital VTR, a digital camcorder, etc.) of an AV equipment, digitization of broadcast, and OCN, etc., are advancing steadily.

[0004] The wave of the promoted above technological innovation including office environment can consider going towards a network from now on. That is, the technique of various fields, such as information, a communication link, and broadcast, is bundled by digitization, and it is said that exchange is begun by network.

[0005] As a network technique used as the base for realizing this, it thinks of various candidates. For example, Ethernet has an overwhelming track record in office environment, and it can be said also in the personal computer network in a home that he is the leading candidate. Moreover, ATM is also a strong candidate. This is because it is a general motion that the construction sides (telephone company, CATV, etc.) of an infrastructure will build an infrastructure using this technique paying attention to the description of ATM, such as a high speed, real time, and a broadband.

[0006] these candidates -- in addition, recently -- IEEE1394 -- a network technique

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[Translation done.]

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EFFECT OF THE INVENTION

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[Effect of the Invention] According to this invention, it is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0476] Moreover, according to this invention, it is not dependent on OS or hardware, and when the need arises, it becomes possible to register a device control program.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] Even if it is going to control conventionally the device which interconnected in domestic or the digital networks between homes, and minded the network (1) There is no technique for getting to know the information about the service currently offered on the location of each device which exists on a network, or the network. A user Existence of specific device/service has not been recognized on a network, and actuation or control of an object device was not able to be performed, or offer of service was not able to be received. Moreover, when the part according to a different protocol in interconnect of digital networks was intermingled, the user was not able to perform the actuation or control of an object device beyond a different protocol by there being no technique which tells an actuation command etc. exceeding a different protocol, or offer of service was not able to be received.

[0027] (2) Although it is thought that the so-called information appliance which had the various Internet processing facilities also in domestic will enter in the still nearer future, it worries about the current Internet at the serious lack of the address. It is unreal it to be thought for that the household-electric-appliances device which enters into domestic becomes very many numbers, and to newly consider an IP address to these [,all ]. Then, the two following approaches are proposed.

[0028] - Domestic uses a private IP address.

[0029] - The IPv6 (IP version 6) address is used for domestic.

[0030] However, as for the actual Internet (public network), it is actual to be applied by IPv4 (IP version 4), and when the above approaches are taken, it does not have the approach of accessing from the Internet to a domestic device. Although the user on the Internet (public network) needs to recognize the address of domestic various devices before actually performing those actuation even if it uses these as a solution for this problem, although NAT (network address translation) and an IP masquerade are known, there is no mechanism which realizes this.

[0031] (3) Moreover, conventionally, since the device driver was dependent on OS and did not have versatility, it had a trouble [ need / respectively / for every various OS's / the driver of correspondence / to be developed ]. Moreover, although building a device driver in abundance beforehand when a peripheral device is diversified was performed well, there was a trouble that the resource of OS will be vainly occupied by the device driver of the equipment which is not used and API corresponding to a higher-level protocol.

[0032] It is not dependent on a specific network and this invention aims at offering the communication device which can realize a unific service provision environment, the service registration approach, and the service provision approach, in order to have been made in consideration of the above-mentioned situation and to solve the 1st trouble of the above.

[0033] Moreover, in order to solve the 2nd trouble of the above, this invention aims at offering the communication device which makes accessible service currently offered in each network even from other networks, even when the networks (for example, IPv4, IPv6 and a private address, IPv4 and a

private address, IPv6, etc.) where address systems differ are interconnected.

[0034] Moreover, in order to solve the 3rd trouble of the above, it is not dependent on OS or hardware, and this invention aims at offering the possible communication device of registering a device control program, and the device control program registration approach, when the need arises.

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[Translation done.]

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MEANS

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[Means for Solving the Problem] (1) This inventions (claim 1) are the communication devices (for example, personal computer etc.) equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment, and are characterized by describing dynamically the information about the service which works on self-equipment (the communication device concerned) for said configuration information storage means.

[0036] According to this invention, it communicates through a communication device, and also by accessing this configuration information storage means, a node can recognize timely the application which that communication device has served at that time, the directory service of a network configuration and the service detection of a migration node of it are attained, and its flexibility of employment of a network improves. Especially the effectiveness of changing service configuration information dynamically, since dynamic change of operation of the service will become more intense with [ the case where operation service changes dynamically, and when service is realized by software ] install of software, version up, etc. will become very big.

[0037] The means of communications which operates the register with which the map of this invention (claim 2) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (It is [ for example, ] a personal computer etc.) and is characterized by describing collectively the information about the service which works on self-equipment (the communication device concerned), and the information (for example, Vendor ID, a node capability, etc.) about the attribute of self-equipment for said configuration information storage means.

[0038] In case according to this invention it communicates through a communication device, and also both the configuration information which used service as the base, and the configuration information which used equipment as the base can be notified to a node and these other nodes constitute the directory information of the network where the communication device is connected, it is effective in simplifying more selection of whether it considers as the configuration information according to service, or to consider as the configuration information according to equipment. Since both the user who has got used to the actuation and retrieval according to service, and the user who has got used to the actuation and retrieval according to equipment exist and it corresponds to the both, this is especially useful.

[0039] The 1st means of communications which operates the register with which the map of this invention (claim 3) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (For example, it is a personal computer etc.) for said configuration information storage means It is characterized by describing a part of



configuration information [ at least ] (for example, information on a terminal, information on service) about the network connected to self-equipment (the communication device concerned) through the 2nd different means of communications from said 1st means of communications.

[0040] According to this invention, nodes other than the communication device concerned connected to the 1st means of communications The network configuration information connected to the communication device concerned at the 2nd means of communications It becomes possible to recognize through this configuration information storage means. This result, It becomes possible to recognize the configuration information of the whole network which interconnected through the configuration information storage means through the 1st means of communications, and, therefore, it becomes possible to attain simplification of structure, such as a network control and network service registration, and time and effort.

[0041] This inventions (claim 4) are communication devices (for example, personal computer etc.) which register service into the directory agent who exists in the connected network, and are characterized by having a means to register the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network into said directory agent instead of this electronic device.

[0042] According to this invention, a directory agent As opposed to the directory service of the protocols (for example, network layer protocols, such as IP etc.) with which it works It becomes possible to register the services (for example, AV/C protocol of IEEE1394 etc.) offered with data link layer protocols (for example, IEEE1394 layer etc.). Consequently, a directory agent or a directory service becomes that offer layer is fair and possible [ being searched ] about the service developed on the network, and becomes possible [ aiming at improvement in a network user's convenience, and improvement in flexibility to coincidence ].

[0043] This inventions (claim 5) are communication devices (for example, personal computer etc.) which notify the information about service according to the inquiry from the user agent in the connected network, and are characterized by to have a means to notify said user agent of the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network instead of this electronic device.

[0044] As opposed to service location service of the protocols (for example, network layer protocols, such as IP etc.) with which, as for a user agent, it works according to this invention It becomes possible to acquire the information about the service offered with data link layer protocols (for example, IEEE1394 layer etc.). Consequently, a user agent or service location service becomes possible [ that offer layer being fair and searching the service developed on the network ], and can aim at improvement in a network user's convenience, and improvement in flexibility to coincidence.

[0045] This invention (claim 6) is set to a communication device according to claim 4 or 5, and is characterized by registering or notifying the logic multiplex identifier of self-equipments (for example, personal computer etc.) as a port for access to said service registered or notified in the case of a notice to the registration to a directory agent, or a user agent.

[0046] If it does in this way, said communication device will become possible [ recognizing that it is access to service of said electronic device when there is access to the logic multiplex identifier ], and it becomes possible to perform suitable processing for actually realizing the service.

[0047] On the other hand, a directory agent becomes possible [ offering the unific directory service which becomes possible / answering /, has this logic multiplex identifier as an access point to service of said electronic device, and does not ask the offer layer of service ].

[0048] Moreover, when this logic multiplex identifier is notified as an access point to service of said electronic device, he does not ask a layer, but a user agent will recognize it as what is provided with that service through this logic multiplex identifier, and it is the whole network and he becomes

possible [ offering the unific service provision organization which does not ask a layer ].

[0049] In a communication device according to claim 6, this invention (claim 7) is characterized by changing into the command of the protocol which depends for this command on said data link corresponding to it, and transmitting to said electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.), when a command arrives at the port specified by said logic multiplex identifier.

[0050] When doing in this way and said communication device has access to the logic multiplex identifier After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and actually offers the service It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0051] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0052] This invention (claim 8) is characterized by having a correspondence table for mapping to the command of the protocol which depends on said data link corresponding to this command for the command which arrived at the port of said logic multiplex identifier in a communication device according to claim 6.

[0053] If it does in this way, said communication device will become possible [ performing command conversion when there is access to the logic multiplex identifier in the procedure for which it was able to opt beforehand ]. By this After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and actually offers the service It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0054] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0055] If this invention (claim 9) cannot communicate if the 1st means of communications is followed, but the 2nd means of communications is followed, the electronic device which can communicate, It is the service registration approach in the communication device connected to the network where the electronic device which can communicate may be connected even if it follows any of the 1st means of communications and the 2nd means of communications. With the electronic device with which registration of the information about the service offered from said each of electronic device through said 1st means of communications was received, and existence has been recognized by said 2nd means of communications and said 1st means of communications about a thing without said notice which leads The information about the service offered by this each of electronic device that should be registered is acquired using said 2nd means of communications. Based on the information about said notified service, and the information about said acquired service, it is characterized by constituting the service directory information on said network.

[0056] It is the service provision approach in the communication device to which at least one electronic device which can communicate was connected when this invention (claim 10) could not

communicate when following the 1st protocol, but following the 2nd protocol. The logic multiplex identifier of self-equipment which follows said 1st protocol as a port for access to the service offered by said electronic device is assigned. When a command arrives at the port specified by said logic multiplex identifier, it is characterized by changing this command into the command according to said 2nd protocol, and transmitting to said electronic device.

[0057] (2) The means of communications which operates the register with which the map of this invention (claim 11) was carried out to single-address space, An acquisition means by which the attribute information (for example, unique ID, unit ID, capability, etc.) on the electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) recognized by said means of communications comes to hand, Registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications It is characterized by having the registration means performed working based on the attribute information on said electronic device which came to hand.

[0058] According to this invention, said device control program will play the so-called role of a device driver, but According to this invention, it is based on the attribute information on the electronic device received by the means of communications which operates the register by which the map was carried out to single-address space. Since the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space is registered, the device control program united with the attribute of the object driven if needed during actuation is incorporable into OS.

[0059] moreover, a device control program -- a network loader -- if provided in a bull form (for example, form described in JAVA language), it will become possible to register a device control program, without asking the classification of OS, and the classification of hardware.

[0060] This invention (claim 12) is characterized by said registration means having a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand with said acquisition means, and a means by which the corresponding device control program comes to hand based on said identifier searched for in a communication device according to claim 11.

[0061] If it does in this way, the device control program which suited the attribute of said electronic device can come to hand if needed, and can be used as a device driver.

[0062] In a communication device according to claim 11 or 12, the attribute information on said electronic device is described by the configuration information storage region (for example, Configuration ROM or configuration memory) where it was beforehand set in said electronic device, and this invention (claim 13) is characterized by said attribute information coming to hand by reading the contents said acquisition means was described to be by said configuration information storage region.

[0063] Thus, if it is made for the attribute information on said electronic device to come to hand by reading the configuration information storage region in the electronic device concerned, it is expected that the attribute information on the device will usually be described by the configuration information storage region, and it is expected that the suitable information used as the key of a coming-to-hand [ a suitable device control program ] sake will be acquired.

[0064] This invention (claim 14) is characterized by offering said single-address space in the form of an IEEE1394 bus in a communication device given in claim 11 thru/or any 1 term of 13.

[0065] Since an IEEE1394 bus can be interpreted as a bus which realizes single room, it is possible to adopt the above-mentioned device as it is, dynamic loading through the network of the device driver of the network which was originally difficult becomes possible, and it can raise a user's convenience by leaps and bounds.

[0066] This invention (claim 15) is characterized by setting to a communication device given in claim 12 thru/or any 1 term of 14, and using the identifier which can direct the specific resource of

an external network as an identifier of said device control program.

[0067] Thus, it becomes possible for the device control program of said electronic device to come to hand from an external network a network loader bull, then if needed, and said communication device is wide opened from the constraint that it must have all the device control programs assumed beforehand, and becomes possible [ enjoying various advantages, such as saving of the capacity of a disk or OS, and version up of software, ].

[0068] A device control program is preferably described in JAVA language etc.

[0069] The communication link between a predetermined electronic device and other communication devices (the 2nd communication device) which can be communicated this invention (claim 16) with a means to operate the register by which the map was carried out to single-address space It is a possible communication device (the 1st communication device) by the means of communications using a logic network. said means of communications -- leading -- said -- others -- a communication device (the 2nd communication device) -- receiving -- said -- an electronic device A means to require acquisition of (attributes [ for example, ], such as personal computer, peripheral-device, AV equipment, and household-electric-appliances device) information (for example, unique ID, unit ID, capability, etc.), A means to perform registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand, It is characterized by having a means to transmit and receive the information about the directions which operate the register on said single-address space through said means of communications between communication devices (the 2nd communication device) besides the above.

[0070] According to this invention, the communication device (the 1st communication device) which is a control subject It can have a function for using said electronic device by considering as agency other communication devices (the 2nd communication device) connected through the logic network. It becomes possible to control a remote electronic device not only through a means to operate the register by which the map was carried out on single-address space but through a logic network, without changing the control program which operates the register on single-address space.

[0071] You may make it the means preferably performed working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand have a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand, and a means by which the corresponding device control program comes to hand based on said identifier searched for.

[0072] Moreover, preferably, the attribute information on said electronic device may be described by the configuration information storage region where it was beforehand set in said electronic device, and said attribute information may come to hand by reading the contents described by said configuration information storage region with the communication device (the 2nd communication device) besides the above.

[0073] Moreover, said single-address space may be preferably offered in the form of an IEEE1394 bus.

[0074] Moreover, the identifier which can direct the specific resource of an external network as an identifier of said device control program preferably may be used.

[0075] This invention (claim 17) is the device control program registration approach of registering a device control program working [ a communication device ]. The attribute information on the electronic device recognized by the predetermined means of communications which operates the register by which the map was carried out to single-address space comes to hand. It is characterized by performing registration of the device control program which controls said electronic device working based on the attribute information on said electronic device which came

to hand by publishing the directions which operate the register on said single-address space to said means of communications.

[0076] In addition, invention concerning each equipment [ more than ] is materialized also as invention concerning an approach.

[0077] Moreover, the above-mentioned invention is materialized also as a medium which recorded the program for making a computer perform a procedure, a corresponding function, or a corresponding means and in which machine read is possible.

[0078] (3) In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 18) of this invention to the 1st network, and it depends on this 1st network through the 2nd network Said 2nd network is minded for the information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment at least. An offer means to provide, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command It is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0079] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 19) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means An offer means to provide through said 2nd network at least, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command It is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0080] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 22) of this invention to the 1st network, and it depends on this 1st network through the 2nd network An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0081] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 23) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, An offer means to offer the homepage for publishing the 1st command depending

on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0082] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 24) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, A creation means to create the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment based on the information about the service collected with this collection means, An offer means to offer the homepage created with this creation means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0083] In addition, the communication device (claim 25) of this invention The table which registered the 2nd command depending on the communications protocol of said 2nd network for controlling this service provision equipment corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service is provided. By acquiring the information about the 2nd command corresponding to the information about the service collected with said collection means from this table, and creating said homepage, to a homepage It becomes possible to display the list of remote control of service provision equipment realizable using the 2nd command information (remote-control command), and it becomes possible to create the homepage which had and enumerated the remote-control approaches which can be employed.

[0084] The communication device (claim 26) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means By changing into said 1st command the 2nd command contained in the message received with said receiving means with reference to the correspondence table of said 1st command and said 2nd command When the 2nd specific command information (remote-control command) is received through said receiving means If the table corresponding to the above is referred to, it comes to be turned out what kind of actuation it should just perform to the equipment (service provision equipment connected to the 1st network in this case) of a request of the 1st network.

[0085] The communication device (claim 27) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment, The address depending on the communications protocol of said 2nd network and the multiplex identifier for specifying said service provision equipment depending on said 1st network are included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the correspondence table of said 1st command and said 2nd command. The node which received the

homepage by controlling the service provision equipment identified in said multiplex identifier by this 1st command By working on the object by which hyperlink reference was carried out as 2nd command information (remote-control command) It becomes possible to operate the service provision equipment which became possible [ specifying the service provision equipment connected to said 1st network which is a controlled system, and specifying actuation of the request ], had and was connected to said 1st desired network by remote control.

[0086] The communication device (claim 28) of this invention moreover, said homepage The program for generating the message containing the 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the correspondence table of said 1st command and said 2nd command. The node which received the homepage by controlling service provision equipment by this 1st command The program (JAVA program) matched with it is started. It becomes possible to operate the service provision equipment which it became possible for the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request to be made to publish, and had and was connected to said 1st desired network by remote control.

[0087] The communication device (claim 29) of this invention moreover, said control means By starting the program (for example, CGI script) for publishing said 1st command by the message received with said receiving means The node which received the homepage starts the program (CGI script) matched with it. the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request -- issue \*\*\*\*\* -- it becomes possible to operate the service provision equipment which what of became possible, and had and was connected to said 1st desired network by remote control.

[0088] Moreover, in case the communication device (claim 30) of this invention transmits information in response to the demand from the partner node which received said homepage by including the information which specifies the communications protocol at the time of transmitting information as said message, the sending-out approach can be specified now, and it can have it, and can send information into a transmitting partner certainly. This has him, especially when the partner who should transmit does not have the receiving capacity of a network layer packet.

[ effective ] Moreover, when the node which receives transmit information is not supporting the same network layer protocol as the 2nd command information (remote-control command), or when great cost starts the capsulation to the network layer protocol of transmit information, it becomes possible to urge the equipment which received said homepage to the information transmission of those other than a network layer protocol.

[0089] Furthermore, the header information depending on this communications protocol at the time of transmitting the information other than information that the communications protocol at the time of transmitting information to said message is specified may be included.

[0090] The communication device (claim 35, 5th operation gestalt) of this invention It is the communication device connected to the 1st network and 2nd network. The 2nd logic multiplex identifier is assigned to the service offered by the 1st logic multiplex identifier of the equipment of the arbitration on said 1st network. The 1st [ said ] logic multiplex identifier and the 1st address of the equipment on the 1st [ said ] network which offers the service, A storage means to memorize the correspondence relation between the 2nd accessible address and said 2nd logic multiplex identifier from said 2nd network, A presentation means to show as service which can access each service of said 1st logic multiplex identifier by said 2nd address and said 2nd logic multiplex identifier from said 2nd network, By performing the packet transfer for offering the service on the 1st [ said ] network shown with said presentation means between said 1st and 2nd networks based on the correspondence relation memorized by said storage means The address system for which the 1st network differs from the 2nd network, For example, when the 2nd network is employed for



the address system of IPv4 [ the case where the 1st network is employed for the address system of IPv6, when the 1st network is employed for the system of a private IP address ] Access to the service currently offered in the 1st network is realizable to the user of the 2nd network.

[0091] That is, to the user of the 2nd network, the service currently offered in said 1st network shows to the 2nd network as what this communication device offers using the homepage as said presentation means. When there is access to this service from the user of said 2nd network The correspondence relation (address port number translation table) memorized by said storage means is used. By changing the user of said 2nd network, and the packet between these communication devices into the packet of the service compartment for which it is provided in this communication device and said 1st network It will be recognized as exchanging the transparent packet from the service currently offered in the user of said 2nd network, and said 1st network.

[0092] (Claim 36) By having provided further a collection means to collect the 1st addresses of the equipment which offers said 1st logic multiplex identifier and each service on said 1st network, it becomes possible to perform renewal of automatic as said presentation means (for example, a homepage) based on the collection information about service of said 1st network.

[0093] (Claim 37) The 2nd storage means which memorizes the identifier of the packet which can be transmitted to said 1st network among the packets inputted from said 2nd network, By having provided an output means to output only the packet which has the identifier memorized by said storage means among the packets inputted from said 2nd network to said 1st network User authentication can be performed beforehand and invasion of an inaccurate packet to said 1st network can be protected from external networks, such as a public network.

[0094]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of invention is explained, referring to a drawing.

[0095] (1st operation gestalt) The example of the structure of a system which starts this operation gestalt at drawing 1 is shown.

[0096] In this example, as shown in drawing 1 , two domestic networks shall interconnect through a public network 2. A telephone network may be used and it may be [ whose public network 2 is ] like the circuit of wide bands, such as ISDN, or a dedicated line the Internet. However, the network with which it is satisfied of a communication band required for use and offer of service preferably is used.

[0097] The 1st domestic network consists of the 1st IEEE1394 bus 1. Moreover, the 1st AV contact 4, a personal computer (the following, PC) 6, and digital [ 7 ] one TV shall be connected to this IEEE1394 bus 1.

[0098] The 2nd domestic network consists of the 2nd IEEE1394 bus 3 and home automation network 12. With this operation gestalt, LON (local operating network) of an echelon company shall be used for this home automation network 12. LON of an echelon company is described in detail by obtaining-, for example from homepage (<http://www.echelon.com>) of echelon company etc. information.

[0099] The 2nd AV contact 5, the DVD player 8, digital VTR 9, PC10, and the printer 11 shall be connected to the IEEE1394 bus 3 of the 2nd domestic network. Moreover, PC10 is connected also to the home automation network 12. The home automation network 12 is connected also to an air-conditioner 13 and a microwave oven 14 besides PC10.

[0100] Among the terminal groups connected to these networks, the 1st AV contact 4, PC6, the 2nd AV contact 5, PC10, and the printer 11 have an IP address (here, it considers as a private IP address), respectively, and are the so-called IP terminal. For the IP address of 192.168.2.254 and PC6, the IP address of 192.168.2.1 and the 2nd AV contact 5 shall be [ the IP address of the 1st AV contact 4 / the IP address of 192.168.1.1 and a printer 11 of the IP address of 192.168.1.254 and PC10 ] 192.168.1.2. Thus, the private IP address or the global IP address shall be used for the IP address of the terminal in this operation gestalt (when a public network 2 is not the Internet but

ISDN etc.) (when a public network 2 is the Internet), and setup (setup of an IP routing table etc.) of the routing device for routing between each terminals, shall be performed appropriately. In addition, although a current global IP address is 32 bits, it is likely to become 128 bits in the near future, and the environment which can assign a global IP address to each terminal is becoming actual.

[0101] On the other hand, digital [ 7 ] one TV, the DVD player 8, and digital VTR 9 are 1394 so-called terminals, and are terminals which interpret only 1394 protocol groups (IEEE1394 -1995, IEC1883, IEEE1394AV/C, SBP, etc.).

[0102] Moreover, an air-conditioner 13 and a microwave oven 14 are the so-called LON terminals, and are a terminal which interprets only the protocol group defined by LON.

[0103] The 1st AV contact 4 and the 2nd AV contact 5 have fundamentally the function which interconnects between two or more networks (they are an IEEE1394 bus and a public network in the case of this operation gestalt), respectively. The internal configuration of these AV contacts 4 and 5 is shown in drawing 2.

[0104] As shown in drawing 2, AV contact of this example has 1394 interfaces 21, the data link switch 22, the public network interface 23, the IP processing facility 24, the FANP processing facility 25, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29. Hardware may realize and software may realize each of these functions, respectively.

[0105] 1394 interfaces 21 are the functions used as an interface with 1394 buses.

[0106] The data link switch 22 is a switch for performing data transfer which straddles between networks. In more detail By reference (for example, reference of a synchronous channel identifier, ATM-VCI, transmission wavelength, etc., etc.) of only a data link layer identifier / information As the data transfer point is known beforehand clearly, it is a switch for transmitting the data which set up with protocols, such as FANP, and transmitted the data inputted from 1394 buses to the public network, and were inputted from the public network to 1394 buses.

[0107] The public network interface 23 is a function used as an interface with a public network. For example, if the data link layer of a public network is ATM, it will have the interface of ATM for the function of ATM signaling etc. logically physically.

[0108] The IP processing facilities 24 are many functions of a series of Internet Protocol (TCP/IP protocol suite), such as TCP/UDP/IP.

[0109] The FANP processing facility 25 is a function to perform the band in the data link layer of the transmission route of data, reservation of a virtual transmission-line identifier, and adjustment. In addition, the detail of a FANP processing facility is explained by reference "network interconnection method" in "REJIDENSHARU environment, the Institute of Electronics, Information and Communication Engineers, the information-network study group research report IN 97-19, and pp.73 1997 [ -78 or ]" (or Japanese Patent Application No. 8-264496, Japanese Patent Application No. 8-272672, Japanese Patent Application No. 9-52125) etc.

[0110] As for the FANP processing facility 25, it is desirable to prepare, in treating service with the need of guaranteeing a wide band to some extent like image data, and when it does not need a band guarantee, it may be excluded. In addition, it is also possible to use the processing facility which followed the RSVP protocol (Resource ReSerVation Protocol; draft-ietf-rsvp-spec-08.txt of the Internet draft) instead of the FANP processing facility.

[0111] Moreover, you may make it control use of FANP processing facility 25 grade according to the service to offer. For example, you may make it determine whether use FANP processing facility 25 grade for every group of an IP address and a port number. Or you may make it determine to use it by the explicit demand from a user.

[0112] The 1394-/IP service location processing facility 26 searches the terminal or service connected to 1394 buses, or receives the registration, and when it is recognized and required what kind of terminal/service should exist on 1394 buses, it has the function which notifies the information outside if needed. The 1394-/IP service location processing facility 26 has the

processing facility of a service location protocol (draft-ietf-svrlc-protocol-16.txt of the Internet draft) at least.

[0113] The service location redundancy 27 works a service location protocol in the form of the service location of IP base to a public network side. Moreover, it is not the service or the terminal connected to 1394 buses, i.e., IP base. Also about the protocol terminal only for IEEE1394 / service (in the 1st domestic network, they are the DVD player 8 and digital VTR 9 at digital [ 7 ] one TV and the 2nd domestic network) which can recognize and process only a series of 1394 protocols While this AV contact has the function which advertises these terminals / service by becoming these services or the substitute server of a terminal When the these-advertised service is received from a public network side (generally the IP side), it has the function which notifies them to 1394 and IP command conversion function 29 that it should map in the command of IEEE1394, or service.

[0114] The 1394AV command-processing function 28 is a processing facility of the terminal-control protocols (for example, a 1394 AV/C protocol, SBP, etc.) of IEEE1394.

[0115] the 1394-/IP command conversion function 29 has been sent using IP -- it is -- it is -- the control command (for example, RTSP (Real Time Stream Protocol) etc.; in addition) to send RTSP is explained in detail at Internet draft draft-ietf-mmusic-rtsp-02.ps, for example -- \*\*\*\* -- The terminal control command (for example, a 1394 AV/C protocol and the command of SBP) of IEEE1394 with which a 1394 bus top is sent is changed mutually, and it has the function notified to the other party.

[0116] Next, in the 2nd domestic network, the procedure of recognizing the terminal and service which exist on the procedure, i.e., the 2nd domestic network, in which the 2nd AV contact 5 acquires the information about the 2nd domestic network is explained.

[0117] An example of the sequence of the terminal / service collection procedure using a device peculiar to IEEE1394 is shown in drawing 3 . The configuration ROM in which the predetermined information about the terminal was written is stored in the terminal connected to 1394 buses, respectively. In drawing 3 , the 2nd AV contact 5 reads the configuration ROM of each equipments 8-11 connected with 1394 buses 3 (lead), and gathers information in each equipments 8-11. This information gathering may be performed to all the terminals that lead to 1394 buses 3.

[0118] Below, some examples are shown about the information described to Configuration ROM. Here, it explains taking the case of the configuration ROM of PC10. In addition, that what is necessary is to just be recognized as a "register" or "a part of room" in fact, although it learns from the specification of IEEE1394 and the phrase "ROM" is used in this example, also when it is not ROM (in the cases of RAM etc.), it shall contain.

[0119] The 1st example of the information described to Configuration ROM at drawing 4 is shown. This example describes the service which that PC10 other than the node information (for example, Vendor ID, node capability, etc.) (31 in drawing 4 ) which is the fundamental information about that terminal offers as unit information to Configuration ROM. That is, this PC10 has the WWW server and the digital album server function, and these are reflected in the contents of the configuration ROM (inside 32 and 33 of drawing 4 ). Thus, it not only explains what kind of terminal self is, but by describing to Configuration ROM, it becomes possible to make it know what kind of service self is offering to other terminals which lead to 1394 buses. Like especially PC, this function is very useful, when two or more functions are realized by one terminal. As information concretely described by Configuration ROM, they are types of services, the attribute (it is the various parameters used in order to receive the service, for example, they are the maximum data transfer rate, an equipment specification, an active parameter, etc.) of the service, etc.

[0120] By the way, it connects also with the home automation network 12, and PC10 also serves as a server of such home automation. That is, control of the various devices (here, there are an air-conditioner 13 and a microwave oven 14) connected with the home automation network 12 has composition which this PC10 performs. In other words, the terminal which leads to the 2nd 1394

bus 3 means that the various devices connected with home automation 12 network are controllable by accessing this PC10. In order to make the terminal on the 2nd 1394 bus 3 know this, the information (service information) about the home automation network 12 is also stored in the configuration ROM of PC10.

[0121] First, the information which shows that home automation service is offered is stored in Configuration ROM (34 in drawing 4 ). This may be made to recognize to be one unit on 1394 buses. Next, the information which shows that Aircon Service and microwave oven service are offered as this unit dependence directory is described by Configuration ROM, respectively (inside 35 and 36 of drawing 4 ). By doing in this way, other terminals which lead to 1394 buses can know now what kind of service is offered how also about the service connected to another network which is not 1394 buses, and recognition of service and the large improvement in the operability are expected.

[0122] Next, the 2nd example of the information described to Configuration ROM at drawing 5 is shown. In the 1st example, the 2nd example has also described the information according to terminal to Configuration ROM besides the description (inside 45-50 of drawing 5 ) about service to description about the service which the terminal offers having been performed as unit information about the terminal (inside 42-44 of drawing 5 ). These are stored as unit information, respectively and may be stored as a unit dependence directory, respectively. Moreover, in order to distinguish that they are the information according to terminal, and the information according to service, the field (respectively inside 42 and 45 of drawing 5 ) which shows those distinction (which unit is it?) may exist.

[0123] Here, the information about the terminal (an air-conditioner 13 and microwave oven 14) connected to PC10 through the home automation network 12 as information according to terminal is stored, respectively (inside 43 and 44 of drawing 5 ). By referring to these, not only the node connected with 1394 buses but the information about other nodes (at this example, they are an air-conditioner 13 and a microwave oven 14) connected to the node connected with the 1394 buses becomes possible [ obtaining on 1394 level ], and that of other 1394 nodes is very effective in integrative management and control of a domestic network.

[0124] Moreover, these are reflected in Configuration ROM as well as the 1st example when this PC10 has a WWW server, a digital album server function, etc. (inside 45-50 of drawing 5 ). The concrete Ruhr of the description is the same as that of the 1st example fundamentally.

[0125] Next, the 3rd example of the information described to Configuration ROM at drawing 6 is shown. This example is the case where only the information about PC10 self is stored. In this case, since the information as not the description that used service as the base but a node, i.e., the information as equipment about self, will be indicated unlike the 1st example and 2nd example, as unit information, the purport whose self is PC or a PC board (for example, 1394PCI board) is indicated.

[0126] Now, the actuation can be demanded from a user by displaying the terminal / service information on the 2nd domestic network collected with the 2nd AV contact 5 as mentioned above on the console of the 2nd AV contact 5 concerned. As the method of presentation in that case, it is also possible to perform the display according to service, and it is also possible to display the terminal base.

[0127] The example of a screen in the case of performing the display according to service to drawing 7 is shown. An icon (i1-i7) is prepared at a time according to [ one ] the service developed on the 2nd home network like drawing 7 , and a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface.

[0128] Here, the screen display of the icon according to service of drawing 7 does not ask a network classification, but is displayed similarly [ it is / the service connected to the 2nd IEEE1394 bus 3, and the service connected to the home automation network 12 / fair, and ]. This is because

it is generally thought that displaying fair as mentioned above is desirable for a user as for to which physical network the service has led in order to be uninterested. The derangement which will be produced when a user is made conscious of a physical network by this can be prevented.

[0129] In addition, there is no need of displaying the information itself written in Configuration ROM not necessarily in a screen, and you may make it display another corresponding information on it. For example, the information currently written in Configuration ROM is considered [ that it is generally a code for experts in many cases, and ], and is considered [ that it is the thin vocabulary of concordance in many cases, and ] by the general user. Though the code which means "digital one VCR" was written to Configuration ROM when the example was given, to Japanese people, this vocabulary has thin concordance. Then, it gets used by the general user and you may make it display it as "deep video" or deep "videocassette recorder" etc. instead of "digital one VCR" in such a case.

[0130] Next, the example of a screen in the case of performing the display according to terminal to drawing 8 is shown. An icon (i11-i15) is prepared at a time according to [ one ] the terminal developed on the 2nd home network like the case according to service, and a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface. Also in this case, by the screen display, a network classification is not asked but the service connected to the 2nd IEEE1394 bus 3 and the service connected to the home automation network 12 are displayed fair.

[0131] As mentioned above, it was the approach of recognizing a terminal or service by reading of the configuration ROM of 1394 buses.

[0132] Next, registration of service using a service location protocol is explained.

[0133] IETF which is the standardization engine of the Internet is examining registration of the service which used the service location protocol, and a retrieval method. these -- an object [ terminal / IP ] -- service -- beforehand -- some -- classifying -- (1) -- the positional information of the server which offers the service to a directory agent (it is also called a directory server in this operation gestalt) is registered according to those services. A user can know the location of service now by asking this directory agent.

[0134] (2) Prepare IP multicast address according to service. the user who is demanding a certain service -- the IP multicast address -- receiving -- " -- the service is where -- the message of the semantics ?" is flown. A user can know now the location of the server which offers the service because the server which offers the service responds to this.

[0135] It has come to be able to perform service registration and retrieval by the two approaches of saying.

[0136] With this operation gestalt, the 2nd AV contact 5 serves as a directory agent of the service location protocol of the above (1).

[0137] IP terminal on the 2nd domestic network (at drawing 1 , they are PC10 and a printer 11) registers the service currently offered into the 2nd AV contact 5 which is a directory agent. First, IP terminal investigates where [ on a network ] the directory agent exists, and completes the procedure for registering service information. It explains making into an example the case where PC10 registers service, and referring to drawing 9 about this.

[0138] PC10 sends out a service request message to the 2nd IEEE1394 bus 3. A service request message is a message of the semantics "the server which offers this service should reply", and more specifically than the case of this example sends out the message of the semantics "the server which offers the directory service should reply."

[0139] Since the target types of services are specified as a service request message, the "predicate" field is prepared, and it is described as a "directory service" to this field, and this message is further sent out by making the destination into the directory (agent DA) Discovery multicast address (IP address).

[0140] In this operation gestalt, in the 2nd domestic network, in order to use only as the 2nd

IEEE1394 bus 3 the network at which an IP packet arrives, the service request message sent out from PC10 reaches the 2nd AV contact 5 and printer 11 which are a directory agent.

[0141] The 2nd AV contact 5 which is the directory agent who received the service request message returns a "directory agent (DA) advertisement" to PC10, in order to notify that self is a directory agent. In addition, since self is not a directory agent, a printer 11 disregards a service request message (a link layer does not usually receive).

[0142] Next, PC10 is receiving a directory agent (DA) advertisement, and a directory agent recognizes existing in the 2nd AV contact 5.

[0143] Next, PC10 performs registration to the directory agent of the service which self offers. With this operation gestalt, PC10 can receive the service request from the outside as a substitute server also about service of the air-conditioner 13 and microwave oven 14 which are further connected with the home automation network 12 while self offers WWW service (concretely http server) and digital album service.

[0144] While PC10 registers the positional information, attribute information, etc. in service registration about each of the WWW service which PC10 self offers, and digital album service, instead of an air-conditioner 13 and a microwave oven 14, the positional information, attribute information, etc. are registered also with each service on the home automation network (LON) 12.

[0145] An example of the contents of the registration information on WWW service and digital album service is shown in (a) of drawing 10, and (b), respectively. URL containing the port number determined as the IP address of PC10 for every service as positional information of WWW service and digital album service is used.

[0146] Moreover, an example of the contents of the registration information on Aircon Service for which PC10 acts to (c) of drawing 10 and (d), respectively, and microwave oven service is shown. In this case, the port number of PC10 is assigned to each substitute service. In the example of drawing 10, 15000 is assigned to Aircon Service on LON and 15001 is assigned to microwave oven service on LON. By this, if, as for an external terminal, Aircon Service and microwave oven service exist on PC10, moreover, these services will be interpreted as their being services on IP level with \*\*\*\*\*.

[0147] When it wants to access the port number 15000 of PC10 when an external terminal wants to access Aircon Service of the home automation network 12, and to access microwave oven service, it accesses the port number 15001 of PC10. When it is interpreted as on the other hand it being a service request for air-conditioners when PC10 is accessed by the port number 15000 and accessed by the port number 15001, it is interpreted as it being a service request for microwave ovens, and the control command of passed IP is translated into the control command of LON, and this is turned and sent out to the actual device on the home automation network 12 (an air-conditioner 13 or microwave oven 14). About this actuation, it mentions later taking the case of access to Aircon Service.

[0148] Thus, by service registration of drawing 9, WWW service, digital album service, Aircon Service on LON, and the microwave oven service on LON will be registered into the 2nd AV contact 5. If service registration is successful, the 2nd AV contact 5 which is a directory agent will turn service acknowledgement (ACK) to PC10, and will be returned.

[0149] In addition, registration of printer service is similarly performed from a printer 11 to the 2nd AV contact 5.

[0150] As mentioned above, it will register with WWW, a digital album, an air-conditioner, a microwave oven, and the 2nd AV contact 5 each the service of a printer of whose is a directory agent in the procedure of registration of a service location protocol.

[0151] Now, it is possible to constitute the service information on the 2nd domestic network together with the information acquired by this registration procedure and the information acquired by reading of the configuration ROM on IEEE1394 which gave point explanation.

[0152] Although the configuration approach can consider various classes With this operation

gestalt, as the example about the service registered with (i) service location protocol this -- preferential -- displaying -- (ii) -- the service which does not appear here -- specifically Are the node which is not recognized in a service location protocol, and about the node recognized in reading of the configuration ROM on IEEE1394 It is the approach of constituting service information based on the information on Configuration ROM, combining the information on both (i) and (ii), and introducing to a user and the exterior as one "service directory information on the 2nd domestic network."

[0153] The WWW service, the digital album service, Aircon Service, the microwave oven service, the printer service and the DVD player service recognized by reading of the configuration ROM on IEEE1394 recognized in the procedure of registration of a service location protocol, and video service are more specifically doubled, and all services are recognized. And an icon (i21-i27) is displayed at a time according to [ one ] the service developed on the 2nd home network on the console of the 2nd AV contact 5, for example like drawing 7 . Moreover, a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface like the above-mentioned.

[0154] By the way, although the user agent who is the user terminal which receives offer of service can ask a directory agent the information about the service on the IEEE1394 bus to which self is connected and can also obtain it instead, with the registration procedure of the information about service to the directory agent who mentioned above, and the same procedure, he is with self receiving the notice from each equipment, and can also obtain the information about service.

[0155] Next, the case where the user (that is, user of the terminal connected to 1394 buses 1) of the 1st domestic network operates the terminal in the 2nd domestic network (that is, terminal connected to 1394 buses 3 or the home automation network 12) by remote control, and does desired actuation through a public network 2 is explained.

[0156] As shown in drawing 1 , the 1st domestic network and the 2nd domestic network interconnect with the public network 2. As mentioned above, a telephone network may be used and it may be [ whose public network 2 is ] like the circuit of a wide band, or a dedicated line the Internet. Moreover, a private IP address or a global IP address shall be used for an IP address (when a public network 2 is the Internet). (when a public network 2 is not the Internet but ISDN etc.)

[0157] Here, the 1st AV contact 4 shall be the directory agent of the 1st domestic network, and shall recognize the service in a network with the same procedure as what explained the 2nd AV contact 5 previously. PC6 and digital [ 7 ] one TV are recognized as a terminal, and, more specifically, a certain service and digital TV service which are offered with PC6 as service are recognized.

[0158] Now, in order to show the service in the 2nd domestic network to the user of the 1st domestic network as first phase, the 1st AV contact 4 tries to collect the service information on the 2nd domestic network (directory information). The 1st domestic network and the 2nd domestic network shall communicate in Internet Protocol in that case. In addition, the technique of this operation gestalt can be similarly applied, when another protocol, for example, IPX, NetBEUI, etc. are used.

[0159] An example of the procedure of information interchange performed to drawing 12 between the 1st AV contact 4 and the 2nd AV contact 5 for collection of service information is shown.

[0160] First, the 1st AV contact 4 sends out the service request which made "predicate" the directory agent towards the 2nd domestic network in order to search the directory agent in the 2nd domestic network. In order to realize this, how to make for example, the number of hop into plurality, and to send an IP multicast (making it a scope include other domestic networks), the approach of sending to the above-mentioned IP multicast address, after attaching source routing or a routing header to the 2nd domestic network, etc. can be considered.



[0161] Here, as an approach of getting to know the IP address, especially IP subnet address (namely, network address) of a house of the other party, for example to the house of the other party, routing information is exchanged by the routing protocol and how to get to know the address of the other party etc. can be considered.

[0162] Now, the 2nd AV contact 5 which is the directory agent of the 2nd domestic network who received this service request tells a directory agent advertisement to the 1st AV contact 4, in order that self may tell the purport which is a directory agent.

[0163] Next, the 1st AV contact 4 sends a service type request to the 2nd AV contact 5, in order to know what kind of service is offered in the 2nd domestic network.

[0164] The digital VTR (this DVTR1394) whose 2nd AV contact 5 is the air-conditioner (this aircon\_lon) connected to LON other than WWW (the service name written by URL is http), a digital album (this album), and a printer (the said lpr) as a service type reply, the microwave oven (this microwave\_lon) connected to LON, the DVD player (this DVD1394) which is 1394 terminals, and 1394 terminals is notified. For example, as shown in drawing 12, "Service:http://", "Service:album://", "Service:lpr://", "Service:aircon\_lon://", "Service:microwave\_lon://", "Service:DVD1394://", and "Service:DVTR1394://" are notified.

[0165] About the device connected to LON, the service information (URL information showing the location of service) notified from PC10 is notified to the 1st AV contact 4 as it is. That is, about the service registered with the service location protocol of IP, it has notified to the 1st AV contact 4 as it is.

[0166] About the service which the 2nd AV contact 5 which is the directory agent of the 2nd domestic network has recognized only as 1394 terminals / service In order to try for the 2nd AV contact 5 self which is a directory agent to offer service as a substitute server of the service It is introducing to the 1st AV contact 4 on IP in the semantics of "DVD on 1394", and "DVTR on 1394" using the new service category "service:DVD1394" and "service:DVTR1394."

[0167] Next, the 1st AV contact 4 which received these information goes into the procedure for collecting the detailed information about each received service.

[0168] An example of the collection approach is shown below. That is, about the service which is [ among those ] interested for the 1st AV contact 4 side about all services received by the above-mentioned service type reply, in order to acquire the location and attribute information, a service request and an attribute request are sent to the 2nd AV contact 5 which is a directory agent, respectively. To a service request, it is answered to a service reply (URL : URL; (for example, Service:DVD1394:// 192.168.1.254:20000) which is specifically the location information on the service), and is answered to an attribute reply (attribute information [ on the service ];, for example, attribute information on DVD on 1394) to an attribute request. In addition, for details, it is described by the documents (for example, draft-ietf-svrloc-protocol-16.txt of the Internet draft etc.) of a service location protocol.

[0169] Although the above-mentioned procedure about DVD1394 service is described to drawing 12, if information is similarly collected about all services the outside of it, the 1st AV contact 4 can collect the service information on the 2nd domestic network like drawing 13.

[0170] Here, about each service of DVD1394 and DVTR1394, as stated also in advance, the 2nd AV contact 5 can receive the service request from the outside now as a substitute server of these services. That is, instead of 1394 nodes, the 2nd AV contact 5 receives the remote command protocol which is the embodiment of concrete service and which is a protocol of IP, and this is changed into 1394 nodes and 1394 protocols, and is made into them (in addition, it mentions later about the detail). Since it can introduce through the service introduction protocol of IP which is the protocol which does not ask a network about the service (here, they are DVD service and DVTR service) whose exchange is originally possible by doing in this way with 1394 protocol, a network is not asked but it becomes sending of the command to the 1394 above-mentioned node, and controllable from IP node of arbitration (it becomes good control).

[0171] The AV contact 5 of [ 2nd ] the information collected by various replys assigns the port number used as the service window, i.e., the port number for each substitute service, about \*\*\*\*\* service (DVD service and DVTR service) in a substitute. Allocation may be beforehand made by the standardization engine etc. and this port number may be decided by the negotiation of nodes. In the case of this operation gestalt, it is made [ service / on 1394 / DVD ] into 20001 about the DVTR service on 20000 and 1394. By this, moreover, it interprets an external terminal (for example, terminal on the 1st domestic network) as it being service on IP level while it interprets the above-mentioned service as existing on the 2nd domestic network.

[0172] Now, like drawing 14 , on the console, the terminal 4 on the 1st domestic network, for example, 1st AV contact, is a form of the list display of the service which self recognizes, and, in addition to the information about the 1st domestic network, it is displayed based on the information acquired on said service location also about the information on service on the 2nd domestic network (for example, domestic network of OO Mr. \*\*). The method of this display may be based on the same plan as the thing of drawing 11 .

[0173] Next, when an external terminal wants to access various services 2nd domestic [ LAN ], the address and the port number which are introduced by URL of drawing 13 are accessed, respectively.

[0174] For example, a user operates the 1st AV contact 4, brings an image through a public network 2 from the DVD player 8 which are 1394 terminals on domestic [ 2nd / LAN ], and the case where this is projected on digital [ 107 ] one TV is considered.

[0175] Actual actuation of a user is as follows, for example. A user clicks on the icon of the DVD player of drawing 14 first. Then, the manual operation button group for DVD player actuation like drawing 15 is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates the DVD player 8 by remote control. Moreover, a click etc. specifies that an accepting station is digital [ TV ] by a certain input approach.

[0176] An example of the sequence about the command group which flows an actual network top to drawing 16 at this time, and a protocol group is shown.

[0177] First, the 1st AV contact 4 slashes an image into digital [ 7 ] one TV, and it operates the following sequences so that it may perform a setup for displaying this. That is, according to IEC1883 protocol, the synchronous channel on the 1st IEEE1394 bus is secured. At this time, the synchronous channel number of the acquired synchronous channel presupposes that it is #y.

[0178] Next, the 1st AV contact 4 sends a command using the control command (for example, 1394 AV/C protocol) with which it was beforehand set in standardization organizations, such as 1394TAs, in order to turn ON a power source digital [ TV / 7 ] and to project the image from synchronous channel #y on a screen. If a command is received, you may make it return ACK to the 1st AV control unit 4. It means that the circuit from the 1st AV contact 4 to digital [ 7 ] one TV was secured by this.

[0179] Getting [ or ] mixed up with this, the 1st AV contact 4 publishes the command to the DVD player 8 to the 2nd AV control unit 5-like in parallel. Here, the DVD player 8 is interpreting the 1st AV contact 4 as it being IP service. A command is published to the port of the substitute server of the 2nd AV contact 5 (IP address = 192.168.1.254), 20000 [ i.e., ].

[0180] Here, as a command for remote operation, RTSP (RealTime Streaming Protocol) is used, for example. RTSP is a protocol for controlling a remote real-time signal, and it has a discussion in IETF which is the standardization engine of the Internet. For details, it is indicated by Internet draft draft-ietf-mmmusic-rtsp-02.ps.

[0181] The 1st AV contact 4 publishes a command (for example, the SETUP command and the PLAY command) required in order to reproduce the DVD player 8 on RTSP.

[0182] The 2nd AV contact 5 which received the SETUP command of RTSP interprets it as the control to the DVD player 8 being started from now on, and performs reservation of the band for image transmission on the 2nd IEEE1394 bus 3 to which the DVD player 8 is connected, i.e., a

synchronous channel. This is performed by IEC1883. Here, the secured synchronous channel number is set to #y. A band may be good also as using experiential values (for example, if it being MPEG 6Mbps(es) etc.), and may include desired value into a message.

[0183] Moreover, the 2nd AV contact 5 which received the PLAY command of RTSP publishes a command to the DVD player 8 with the corresponding command (for example, a command called DVD-PLAY shall specify) to which this was specified as protocols between 1394 terminals, such as 1394 commands, i.e., a 1394 AV/C protocol etc.

[0184] Conversion of such a command is performed by the 1394-/IP command conversion function 29. The flow of the processing is explained referring to drawing 17. The command on IP is received by the service location redundancy 27. Command conversion of the received command is carried out by the 1394-/IP command conversion function 29. As it was called the table 61 corresponding to a command for DVD, and the table 62 corresponding to a command for DVTR, it prepares according to service of the table which described the relation between the command on IP (or actuation), and the command on 1394 (or actuation); the command sent by IP based on the table according to these services is changed into the command of 1394; and, specifically, delivery sending out is directed for this to the 1394AV command-processing function 28. And sending out of an actual command is performed by the 1394AV command-processing function 28 in which directions were received.

[0185] In addition, a procedure becomes the same, when a command flows in the direction contrary to the above, namely, also when 1394 commands are inputted and it changes and outputs this to the IP command. That is, 1394 commands are received by the 1394AV command-processing function 28, this is changed into the IP command based on the table according to service in the 1394-/IP command conversion function 29, and this is sent out by the service location redundancy 27.

[0186] Now, if it does in this way and a command reaches the DVD player 8, transmission of actual image data will be performed through synchronous channel #x of the 2nd 1394 bus 3. After an ACK signal returns (an ACK signal may be changed in addition into O.K. of RTSP on public networks (ISDN or Internet)), as for this, actual data transfer is started.

[0187] The 2nd AV contact 5 sends out image data to a public network 2 through the data link switch 22. This may be sent in an MPEG multiplex form in that case.

[0188] The sent-out image data are sent to the 1st AV contact 4 through a public network 2. The 1st AV contact 4 sends the received image data to synchronous channel #y of the 1st 1394 bus 1 through the data link switch 22, and, finally image data are reproduced in digital [ 7 ] one TV. Consequently, the 1st user domestic [ LAN ] can see now the image from the DVD player 8 on domestic [ 2nd / LAN ] in digital [ 7 ] one TV.

[0189] In addition, as mentioned above, it is desirable that the FANP processing facility 25 or other RSVP processing facilities realize the band in the data link layer of the transmission route of image data, reservation of a virtual transmission-line identifier, and adjustment. By using FANP etc., it becomes securable [ the communication resource which does not ask network classification ]. An example of the sequence at the time of making it such is shown in drawing 18. In drawing 18, reservation of the communication resource of the data link which serves as a path of image data by FANP, adjustment of an identifier, a setup of a contact, etc. are performed in advance of sending of actual image data.

[0190] Next, it considers that the 1st user domestic [ LAN ] operates the 1st AV contact 4, and operates the air-conditioner 13 (it is a LON terminal) on domestic [ 2nd / LAN ] as other examples of remote operation through a public network 2.

[0191] Actual actuation of a user is as follows, for example. A user clicks on the icon of the air-conditioner of drawing 14 first. Then, the manual operation button group for air-conditioner actuation is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates an air-conditioner 13 by remote control.

[0192] An example of a sequence is shown about the command group and protocol group which flow an actual network top to drawing 19 at this time.

[0193] First, the 1st AV contact 4 publishes the command to an air-conditioner 13 to PC10 of a substitute server shown on a service location. Here, the 1st AV contact 4 is interpreted as it being IP service whose PC10 offers the air-conditioner 13. A command is published to the port of PC10 which is a substitute server, 15000 [ i.e., ].

[0194] Here, CCCP (Cam CoderControl Protocol) can be used as a command for remote operation. Although CCCP is a protocol for performing control of a remote camcorder through the Internet, control of various electrical machinery and apparatus shall be possible at the same view, and the command group for air-conditioners shall exist in CCCP especially. In addition, the detail of CCCP is indicated by Internet draft draft-ohta-ccc-video-00.txt.

[0195] The 1st AV contact 4 publishes a command (POEWR\_ON command) required to turn ON the power source of an air-conditioner 13 on CCCP.

[0196] PC10 which received the POWER\_ON command of CCCP publishes a command for an air-conditioner 13 with the corresponding command (for example, a command called LON\_POWER\_ON shall specify) to which this was specified as a protocol between the LON command and a LON node.

[0197] Conversion of such a command is performed within PC10. The flow of the processing is explained referring to drawing 20 . The service substitute reception function 71 receives the command on IP. Command conversion of the received command is carried out by the CCCP/LON command conversion function 72. The table corresponding to a command for LON, i.e., the table which described the relation between the command on IP (or actuation) and the command on LON (or actuation), is specifically prepared in the CCCP/LON command conversion function 72, it changes into the command which should be sent to an air-conditioner 13 through LON from the command sent by CCCP based on this table, and delivery sending out is directed for this to the LON command issue function 73. And sending out of an actual command is performed by the on-command issue function 73 in which directions were received.

[0198] A procedure becomes the same, when a command flows in the direction contrary to the above, namely, also when the LON command is inputted and it changes and outputs this to the CCCP command.

[0199] In addition, when an ACK signal returns (the ACK signal is shown in addition as O.K. in; drawing 19 which may be changed into O.K. of CCCP on public networks (ISDN or Internet)) This is also notified to the 1st AV contact 4.

[0200] In addition, it cannot be overemphasized that the mechanism explained with this operation gestalt can be applied not only to a domestic network but to a general company network and the network technique for realizing especially the so-called "mobile environment."

[0201] Moreover, although this operation gestalt explained as a protocol of a network layer, using IEEE1394 and LON as a protocol of IP and a data link layer, it is also possible as a protocol of a network layer DSM-CC which is advancing the standardization by DAVIC, and to use techniques, such as Ethernet and ATM, as a protocol of data link layers, such as IPX.

[0202] By the way, although the function of service location service and the function of command conversion were prepared in AV contact and AV contact offered service with the above-mentioned operation gestalt, the node which is performing AV contact of this operation gestalt, i.e., network interconnect, does not need to perform these functions, for example, it prepares in PC6 or PC10 in drawing 1 , and service may be made for them to provide.

[0203] in this case, like the case where AV contact of drawing 2 has realized service Network I/F (equivalent to 1394 I/F21 of drawing 2 R> 2), the IP processing facility 24, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29 The control to which mount in the node of PC6, PC10, or others, and a network communication resource is made to secure

further, What is necessary is just to mount the FANP processing facility 25 or the control processing facility by RSVP, when network control, such as control which adjusts the identifier used between networks, is required.

[0204] Moreover, it is also possible to mount the function of service location service and the function of command conversion for differing mutually.

[0205] In addition, although a private IP address is used for the IP address of a terminal when a public network 2 is not the Internet but ISDN etc., or a global IP address shall be used for the IP address of a terminal in the above explanation when a public network 2 is the Internet For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node ( drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes. In this case, from an external network The global IP address of the node which interconnects a network, A group with the port number for pointing to the private IP address (or group of a private IP address and a port number) of the node used as the destination is made into the destination. Transmit an IP packet and a table is referred to in the node which interconnects a network. You may make it change the group of the global IP address and a port number concerned into the private IP address (or group of a private IP address and a port number) of the node used as the destination.

[0206] (2nd operation gestalt) This operation gestalt explains the case where 1394 equipments by which PC with an IEEE1394 interface was connected to the 1394 same buses are recognized and used.

[0207] Generally, various equipments may be connected to 1394 buses and PC does not have the driver software for controlling the information and it about all the equipments connected beforehand.

[0208] So, with this operation gestalt, information on the equipment connected to 1394 buses is collected. The outline of the procedure is as follows.

[0209] i) 1394unit is recognized first. Specifically, it is unique of 1394 nodes. ID and a unit number are acquired.

[0210] ii) Next, category distinction of each unit is performed. And it judges whether it is a category corresponding to a registered logical device.

[0211] An occupancy condition is acquired about iii, next a registered device (a standard driver is used still in this case).

[0212] iv) And the occupancy condition of 1394unit(s) which are not registered is judged.

[0213] Moreover, with this operation gestalt, the following are treated as an event which occurs in asynchronous and changes the configuration of a device driver.

[0214] i) Bus reset of the use demand iiIEEE1394 interface of the equipment by application (addition of 1394 equipment, deletion)

iii This operation gestalt is explained in detail below modification of the occupancy condition of equipment.

[0215] First, a hardware configuration is explained.

[0216] The example of a configuration of PC applied to this operation gestalt at drawing 21 is shown. the main memory by which, as for 82, the processor was connected [ 81 ] to the local bus of a processor for PC, as for 83 -- 84 -- a system bus -- 86 and 87 express an IEEE1394 interface and, as for 88, 85 expresses a hard disk for secondary storage, respectively.

[0217] Secondary storage 85, the IEEE1394 interface 86, and the IEEE1394 interface 87 are connected to the system bus 84, respectively. Secondary storage 85 is constituted by the flash EEPROM.

[0218] The hard disk 88 is connected by the IEEE1394 interface 87 in the interior of the case of PC81.

[0219] The IEEE1394 interface 86 is connected to the printer 90 placed out of the case of PC81,

FAX91, massage equipment (it is only called massage equipment below; used as reclining seat mold massage equipment) 92, and a toaster 93, respectively. In addition, on explanation, FAX91 shall have a unit corresponding to a FAX function and scanner ability, and a unit corresponding to printer ability, and massage equipment 92 shall have a unit corresponding to the massage device to upper-half-of-the-body parts, such as the back and a neck, and a unit corresponding to the massage device to lower-half-of-the-body parts, such as a guide peg.

[0220] Next, the software structure of an operating system (the following, OS) is explained.

[0221] An example of the software structure in PC81 of this operation gestalt is shown in drawing 22.

[0222] In the interior of OS of drawing 22, in 101, the logical device function manager of OS and 102 express a secondary-storage function manager, and 103 expresses 1394 interface management functions, respectively.

[0223] OS manages secondary storage 102, and a hard disk 103 directly. On the other hand, about each hardware of a printer 90, FAX91, massage equipment 92, and a toaster 93, recognition and registration of a device are performed through 1394 function managers (about this procedure, it mentions later).

[0224] 111,112 is a device driver which the subordinate of the secondary-storage function manager 102 has, and controls secondary storage 85 and a hard disk 88, respectively. 113,114 is a device driver which the subordinate of 1394 interface management functions 103 has, and controls the IEEE1394 interfaces 86 and 87, respectively, respectively.

[0225] OS of drawing 22 API (Application Programing Interface) and JAVA 121 expresses a 1394 management object between APIs.

[0226] JAVA of drawing 22 SPI (System Programing Interface) and JAVA In between APIs 122 expresses a logical device management object. 131,132,133,134, respectively A modem, A printer, a scanner, and the logic device-class object that corresponds unknown are expressed. 131-1-2,132-1,133-1,134-1-3 express the logical device object managed by the logic device-class object of 131,132,133,134, respectively (about the detail of an unknown class, it mentions later).

[0227] OS of drawing 22 API and JAVA In between SPIs 151 to unit1 (104 in drawing 2222) of a printer 90 To unit1 (105 in drawing 22) of FAX91, 153 152 to unit2 (106 in drawing 22) of FAX91 154 expresses the physical device object corresponding to unit1 (109 in drawing 22) of a toaster 93 in 156 corresponding to unit2 (108 in drawing 22) of massage equipment 92 in 155 to unit1 (107 in drawing 22) of massage equipment 92, respectively. Moreover, 161, 162, and 163,164,165,166 express the driver object corresponding to the physical device object of 151-156, respectively.

[0228] An arrow head expresses the reference relation of each object in drawing 22. By having reference relation, the method of the object of a reference place can be started and a state variable can be read. For example, the physical device objects 151-156 mean being registered as a physical device object which the subordinate of a 1349 management object has by having the reference relation which starts in the 1394 management object 121. 151 is registered into the logical device object 131-2 of a printer class, the driver object 161 is registered into the physical device object 151, and other things are the same.

[0229] Next, initialization of OS is explained.

[0230] After powering on, PC81 reads the program stored in secondary storage 85, and starts OS. Although not asked especially about the general specification of OS, the compiled Java code shall be performed on OS. In addition, it is Java although there is various reference about Java. Language Specification It is explained in detail at <http://java.sun.com>.

[0231] With this operation gestalt, the hard disk 88 connected to the IEEE1394 interface 87 is beforehand decided as 1394 equipments directly managed by OS. PC81 is unique of the IEEE1394 interface of PC81 self to the register with which it operates "Look an IEEE1394 device like [ the writing or read-out of a value to a register ]", and the hard disk 87 was defined beforehand. By writing in ID shows that PC81 with the IEEE1394 interface 87 uses a hard disk 88 exclusively.

[0232] OS of PC81 has API (Application Programming Interface) which can perform issue and a response of the transaction request of an IEEE1394 interface from a Java program. The Java code which manages the IEEE1394 device connected to each 1394 interfaces through Above API is performed after starting of OS by initialization of PC81. This is called a 1394 management object. Moreover, OS shall be equipped with the dynamic object loading device which obtains the identifier of the code which corresponds from the identifier of an object class, and generates an object.

[0233] Below, the object by which xx class object and a certain class were substantiated in the object in connection with the xx code and a certain whole class for storing of the Java code and a transmission gestalt is called xx object. For example, Java of the equipment corresponding to a logic device-class object and each physical unit for the object which manages a certain type of all logical units. The object which offers API is called a logical device object. Moreover, a certain identifier shall be given to the code of an object and it shall be discriminated from other objects. The identifier may be embedded at object code and may be expressed by the address of ISO1212 format that the file name or it which stores it is stored. On the other hand, the identifier discriminable from other objects shall be given to a meaning by the PC concerned at least at the object. For example, it is the address of the virtual-memory space where an object is stored. In case it is used by IEEE1394 bus, as for an identifier, to be identified by the meaning on an IEEE1394 bus is desirable.

[0234] Next, recognition of a physical unit is explained.

[0235] Completion of initialization of 1394 interfaces by OS generates the 1394 management object 121 and the logical device management object 122. The 1394 management object 121 and the logical device management object 122 hold mutual reference, and they perform recognition and registration of a device, exchanging information mutually.

[0236] The 1394 management object 121 collects the information on the equipment connected to the IEEE1394 interfaces 86 and 87, and recognizes 1394 nodes each. However, the hard disk 87 with which OS was beforehand defined as what is used exclusively at the time of initialization of the 1394 management object 121 is excepted from recognition. The 1394 management object 121 is node in the TOPOLOGY\_MAP register or SPEED\_MAP register which 1394 interfaces each of PC81 have through the above-mentioned 1394 control API. The read-out demand of a configROM field is published to each node for every ID, and it is unique of the node concerned. It will be each unit if ID and unit recognize two or more existence. ID and capability are obtained. The format of these registers is IEC. It is set by 1212 (ANSI/IEEE Std 1212 Control and Status Register(CSR) Architecture for Microcomputer Buses[ISO/IEC13213]), and, for details, omits here.

[0237] Finally the 1394 management object 121 is unique. The list of groups of ID, unitID, and capability is obtained, and these devices are registered. The 1394 management object 121 reads the value of the above-mentioned register from a printer 90, FAX91, massage equipment 92, and a toaster 93, and generates the 1394 physical-unit objects 151-156 corresponding to each unit. FAX92 and massage equipment 93 have two unit(s), and generate the physical device object 152,153,154,155 which corresponds, respectively. If generation of an object is completed, the 1394 management object 121 will notify completion of physical device registration to the logical device management object 122.

[0238] The equipment removed from the object of recognition is good also as not considering as the object of recognition, when the value which the own register of equipment other than the equipment beforehand occupied by OS expresses occupancy, and shows occupancy there is written in.

[0239] Here, before explaining registration, the structure of a program (here, it is called an object) and actuation which control a device are explained.

[0240] It corresponds to the function of each equipment and 131-1,132-1 and the logical device object of -- provide application with I/O API. Each logical device object is managed by logic device-class objects prepared for every classification, such as a file and a printer. Although each

logical device object belongs to only one logic device-class object, one logic device-class object may have two or more logical device objects in a subordinate. For example, although the logical device object 131-1 of a printer belongs to only one logic device-class object 131, the subordinate of the logic device-class object 131 of a printer has two logical device objects of 131-1,131-2.

[0241] A physical device object exists in 1394 units and 1 to 1 correspondence. One physical device object may be referred to from two or more logical device objects. For example, the physical device object 152 is referred to from two logical device objects, the logical device object 131-1 of a printer, and the logical device object 133-1 of FAX, while it supports unit1 of a printer 91.

[0242] With this operation gestalt, PC81 shall have a printer, a scanner, FAX, and the logic device-class objects 131-134 corresponding to each unknown device class. Each logic device-class object is [ -- It has n. ] the logical device object 131-1 to the subordinate. -- It is n and 132-1. -- It is n and 133-1. -- It is n and 134-1. The physical unit with which the Java application performed with PC81 belongs to the difference in mounting of a physical unit through these logical device object at the class of \*\*\*\*\* identitas can be used by the same approach. This is Java for every logic device-class object. It is because SPI is communalized.

[0243] For example, the address and the procedure of an IEEE1394 register at the time of accessing printer equipment are ANSI. X3T10 Serial Bus It is set as Protocol (SBP). A printer is controllable, if a device driver generates the message of an IEEE1394 format in accordance with Above SBP no matter an IEEE1394 interface may be mounting [ what ]. Furthermore, if the device driver is described by Java independent of hardware or OS, as long as the system program interface to the driver of an IEEE1394 interface is the same, in any OS's, the same printer device driver is usable.

[0244] Application can obtain the list of the logic device-class objects 131-134 by requiring a device-class list of the logical device management object 122. The list of the logical device objects belonging to the same types, such as each printer and a scanner, can be obtained from a logic device-class object. The logical device management object 122 also performs management of registration/deletion of a logic device-class object.

[0245] Next, initialization of the logic device-class object by the logical device management object 122 is explained. An example of a logical device management object initialization procedure is shown in drawing 23 .

[0246] The logical device management object 122 generates the logic device-class object 131,132,133 corresponding to the device class defined beforehand, a printer, a scanner, and FAX, and makes reference between these objects shown by the arrow head in drawing 2 (steps S11-S14).

[0247] Each logic device-class object of these 131,132,133 initializes following generation (; step S15 to which the logical device management object 122 waits for the completion of initialization in the meantime). Completion of initialization notifies that initialization was completed to the logical device management object 122.

[0248] The logical device management object 122 which received the notice of completion generates and initializes the unknown logic device-class object 134 which manages the physical device which finally has not been recognized by each logic device-class object of 131-133 (steps S16 and S17). The logical device management object 122 will be in the completion condition of initialization, if the notice of completion of initialization of an unknown class is received (step S18).

[0249] Next, it explains, taking the logic device-class object 131 for an example about initialization of a logic device-class object. An example of a logic device-class object initialization procedure is shown in drawing 24 .

[0250] The logical device management object 122 passes the reference to the 1394 management object 121 to the generate time of a logic device-class object. The logic device-class object 131 requires the reference to a physical device object of the 1394 management object 121 (step S21).

[0251] The 1394 management object 121 will return reference in an order from the physical device



object 151 according to the reference which the self-object holds, if reference of a physical device object is required.

[0252] When the reference to the physical device object 151 comes to hand, the logic device-class object 131 starts the attribute value acquisition method of an object 151, and is unique. ID, unit ID and capability are acquired (step S22). These values have beforehand the table which judges whether it agrees in self-device class, and the logic device-class object 131 can judge whether the acquired physical device object 151 agrees in a self-class.

[0253] unique of a physical device 151 ID, unit Since ID was a value which shows a printer, the logic device-class object 131 generates the logical device object 131-1 corresponding to the physical device object 151, and makes initialization start. Also at this time, as for a logic device-class object and a logical device object, it has reference relation mutually, and the logical device object 131-1 is registered as a subordinate of the logic device-class object 131 (steps S23-S24).

[0254] This judgment is unique. ID, unit The combination of not only ID but other attribute value may perform. Moreover, it is unique, without a logic device-class object having a table. ID and unit You may ask the retrieval server which is out of PC81 by using ID as a key.

[0255] Hereafter, succeedingly, the logic device-class object 131 requires the reference to a physical device of the 1394 management object 121, and does the same activity even to the last physical device 156 about 152, 153, and --. Since unit2 of FAX152 has capability of a printer, this is also registered into a printer class object as a logical device object 131-2 (steps S21-S24).

[0256] After an activity is completed about all physical device objects, it waits for the notice of the completion of initialization from the registered logical device object 131-1,132-2 (step S25). If the notice of the completion of initialization from the logical device object 131-1,132-2 is received, the logic device-class object 131 of a printer class will notify completion of initialization to the logical device management object 122 (step S26).

[0257] Next, it explains, taking the logical device object 131-1 for an example about initialization of a logical device object. An example of a logical device object initialization procedure is shown in drawing 25.

[0258] After the logical device object 131-1 initializes own attribute value, it publishes an initialization demand to a physical device 151, and waits for the notice of completion from 151 (steps S31 and S32). Reception of the notice of completion publishes the notice of completion to the logic device-class object 131 of a printer class (step S33). The physical device object 151 which received the initialization demand determines the device control code corresponding to a physical unit 90, reads it, generates the device control object 161, and registers it into a physical device object.

[0259] Next, it explains, taking the physical device object 151 for an example about initialization of a physical device object. An example of a physical device object initialization procedure is shown in drawing 26.

[0260] In addition, generation of a physical device object is performed by the 1394 management object 121 before generation of a logical device object, and when, as for initialization here, the 1394 management object 121 generates the physical device object 151 unlike generation, the code of a printer control proper is not read.

[0261] The device control code to load is determined as follows, for example. The 1394 management object 121 is attribute value unique. ID, unit It is the attribute value unique to which it has the table which searches for the class name of a device control code from ID, capability, and a logic device-class object, and self has the physical device object 151 in the 1394 management object 121. The inquiry demand containing ID, unitID, and capability is published, and a class name is acquired as the return value (step S41). The identifier of a device control code is good at the pathname which shows the file of the PC concerned as mentioned above. Of course, the inquiry based on attribute value may be published and acquired to the exterior of PC81.

[0262] A device control code is loaded by the dynamic object loading function from the class name

acquired by the above-mentioned approach, the device control object 161 is generated, and it registers with the physical device object 151. The physical device object 151 publishes the initialization demand of hardware, after initializing attribute value of the device control object 161 (steps S42-S44).

[0263] It will be read if the code corresponding to a class name exists locally. If the class name shows the resource on the network of RIMOTO, it will acquire from on a network. When it does not exist locally [ even when the class name has not pointed out the resource on a network clearly / a code ], the location on a network is acquired using the retrieval server on a network etc., and a code is read.

[0264] Next, the device control object 161 prepares the packet which performs the register writing for initialization of hardware, and initializes a call and a physical unit 90 for the system call of 1394 transactions. If initialization is completed, the physical device object 151 will publish the notice of completion to the logical device object 131-1 (step S45).

[0265] By the way, the thing registered into two or more logical device objects (131-1,133-1) like [ a physical device object ] the physical device object 152. Such a physical device object will receive two initialization demands or more. In the 2nd initialization, if it compares whether it is the same as that of the device control object which the device control object determined from attribute value gained at a time (step S44), and same and it is [ the same thing is used and ] different, a device control object will newly be read and generated. Although the same device control object 162 is used for a printer class and a FAX class in the physical device object 152, for this, a device control object is Java of both a printer and FAX. It is because it is what supports SPI. The device control object loaded first is Java of a printer class. If only SPI is supported and the FAX class is not supported, the device control object which newly supports both searches and comes to hand, or the support of a FAX class is stopped. If coexistence is impossible, suppose that priority is given to the class loaded first.

[0266] Now, when logical device classification generally increases, it is inefficient-like in respect of use of resources, such as memory, to prepare beforehand all the logic device-class objects that may be used. Moreover, when one physical unit may be used from many logic device-class objects and a low order device control program (device control object of this operation gestalt) is changed depending on a high order logic device-class object, the procedure of determining a high order logical device according to a physical device becomes complicated. Especially, he is IEEE. By bus which is introduced into a home like 1394 buses and used also as a domestic network, it is difficult to limit the device connected beforehand.

[0267] It is appropriate in the above-mentioned network for a user to determine the high order logical device rather specified according to a user's use gestalt, and to use the connected equipment by the approach. For this reason, with this operation gestalt, by preparing an unknown device class, the usage has recognized strange equipment for the time being, and the approach of newly adding the high order logical device set by equipment so that it might mention later in detail is taken.

[0268] The 1394 management object 121 has the table of the class name corresponding to two or more logical devices and attribute value, and in case a physical device object performs 2nd initialization, the identifier and attribute value of two logic device-class objects may be specified, and you may ask the 1394 management object 121.

[0269] Next, initialization of the unknown logic device-class object 134 is explained.

[0270] The unknown logic device-class object 134 receives the reference to the 1394 management object 121 to a generate time like the logic device-class object 134 to 131-133. And the reference to each physical device object of 151, --, 156 is obtained like initialization of the logic device-class objects 131-133.

[0271] The unknown logic device-class object 134 obtains the reference to the physical device object 151 first. The unknown logic device-class object 134 asks the physical device object 151

whether have the reference to a logical device object, if it has, will stop recognition of the physical device object 151, and will receive the reference to the following physical device object 152. Since each is registered into other logical device objects, the physical device object 151,152,153 does not perform registration as an unknown device.

[0272] On the other hand, the physical device object 154 does not have the reference from a logical device object. The unknown logic device-class object 134 generates the logical device object 134-1 corresponding to the physical device object 154, and registers it into self here. The logical device object 134-1 registers the physical device object 154 into self. The unknown logical device object 134-1 does not require initialization of the physical device object 154. Therefore, a device control object is not registered into the physical device object 154 at this time.

[0273] Initialization with the same said of the physical device object 155,156 is performed hereafter, the unknown logical device object 134-2,134-3 is generated, the notice of completion is published, and initialization of an unknown device class is completed.

[0274] The logical device management object 122 will be ended if generation initialization of the logic device-class object defined beforehand and generation initialization of the unknown logic device-class object following it are completed. If initialization finishes, the logical device management object 122 can reply to a device-class list demand from application. Before initialization is completed, the answer of use impossible is returned to the inquiry from application.

[0275] Next, use of the device from application is explained. Here, taking the case of the case where a printer 90 is used, it explains from application.

[0276] In addition, it is Java about the interface between a physical device and a logical device. It is Java about between SPI, a logical device, and applications. It is referred to as API. In these, APIs between OS and Java differ.

[0277] The application program shall know the reference to the logical device object 131-1 corresponding to a printer 90 by predetermined approaches, such as an inquiry to OS.

[0278] For example, application knows beforehand the reference to the logical device management object 122, gains the reference to a printer class through the logical device management object 122, and receives the reference to a printer 131-1 from a printer class. Or the naming service about an equipment configuration may be offered.

[0279] An application program publishes a printing demand to the logical device object 131-1 by making reference to a postscript file into an argument.

[0280] The logical device object 131-1 gets to know that it is a postscript file from the header information of a file, and develops a postscript file to a bitmapped image. And the logical device object 131-1 publishes a printing demand to the physical device object 151 by making reference to an object including information, such as paper size assignment of those other than a bitmapped image and a bit map, into an argument. In addition, it is desirable to perform queue processing by the logical device object 131-1.

[0281] The physical device object 151 transmits the bit map information corresponding to a printing image to a printer 90 through the device control object 161. That is, the flag which PC81 uses for the CSR register A with which the printer 90 was defined beforehand by the lock transaction is written in. If it succeeds in lock and the royalty of a printer is acquired, next, a setup of the Isochronous channel on the IEEE1394 bus for transmitting data and the transaction which sets up printers, such as paper size and tray information, will be published. If a channel is gained, bit map information will be transmitted and a transfer will be completed, the transaction of the completion of a transfer will be published and the printing directions to a printer will be completed. Since the printing situation in a printer is displayed on a certain CSR register, completion of printing is got to know when a physical device object polls it.

[0282] Next, use of the equipment registered as an unknown type is explained taking the case of message equipment 12.

[0283] Software structure when drawing 27 adds a logic device-class object, an example of the

new device-class addition demand procedure according [ drawing 28 ] to application, and drawing 29 show an example of the new device-class addition procedure by the logical device management object 122, respectively.

[0284] Application publishes the list acquisition demand of logic device class to the logical device management object 122 (step S51). Acquisition of the reference to the unknown logic device-class object 134 requires list acquisition of a logical device of the unknown device class 134 (steps S52 and S53).

[0285] Application chooses the reference to the logical device object 134-1 corresponding to message equipment 92 from a list, and requires available logical device information (step S54).

[0286] The logical device object 134-1 acquires the attribute value from the physical device object 154, and publishes the retrieval demand of logic device class with the available physical device object 154 to the logical device management object 122. The logical device management object 122 has the table to which a logic device-class name is made to correspond from attribute value like previous statement. A logic device-class name or its list is returned to a logical device 134-1 from this table, and a logical device 134-1 acquires a logic device-class name to a demand, and notifies it to application as logical device information. Of course, it does not matter even if it carries out by asking the server on a network retrieval of a device-class name also here. It is desirable to store explanation by the object code of the default driver of message equipment and the natural language of directions in the storing location of a driver object at least.

[0287] Application chooses the logic device-class name "message equipment" to be used, and publishes a logic device-class registration demand to the logical device management object 122 (steps S55, S56, and S57).

[0288] The logical device management object 122 generates the new logic device-class object 135 corresponding to the specified class name (step S61), and inserts it between the unknown logic device-class object 134 and an unknown class, and the logic device-class object 133 of FAX linked (step S62). And the logical device object 134-1,134-2 registered into an unknown device class until now is deleted (step S63), and an initialization demand is published to the logic device-class object 135 (step S64). This condition is shown in drawing 27. The procedure of future step S65 and step S66 and the initialization procedure of the new logic device-class object 125 are the same as that of what was already explained. In addition, 135-1 is the newly generated logical device object among drawing 27.

[0289] Here, although the example which searches the logical device corresponding to an unknown device was explained, a new corresponding logical device may be searched from the combination of the existing physical device. For example, it is a case so that available new logical device FAX may be searched with the combination of each physical device with the function of a printer, a scanner, and a modem.

[0290] By having the above-mentioned function, the unnecessary program for controlling the device which is not used usually is not read at the time of initialization of a system, but by reading, when needed, can save resources, such as memory of PC, and can reduce cost.

[0291] Next, the configuration change event of 1394 devices is explained.

[0292] The connection situation of 1394 equipments that PC can be used may change. And by IEEE1394 bus, a configuration can be changed by the insert and remove of a connector working. This modification result must be reflected in a logical device as an addition and deletion of a device object. Moreover, if occupancy of the device by a certain equipment is completed, the device will become available with other equipments. Below, the procedure of recognizing change of such a configuration is explained.

[0293] Generating of bus reset notifies bus reset to the 1394 management object 121 from 1394 interfaces of OS. Again, the 1394 management object 121 acquires a list of 1394 physical units from TOPOLOGY\_MAP and SPEED\_MAP, and is those unique(s). ID is acquired and correspondence with a known device is taken.

[0294] First, the 1394 management object 121 makes "unknown" exist attribute value of all physical device objects after bus reset.

[0295] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When in agreement with ID, the equipment is registered and already considers exist as "existence."

[0296] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When not in agreement with ID, the equipment is equipment added newly, carries out generation initialization of the physical device object, and considers exist as "existence."

[0297] They are all NODE(s) about this actuation. After following ID, the physical device object to which exist is unknown deletes it as that from which corresponding equipment was removed. If a physical device object is deleted, it is notified to a corresponding logical device object, and after a logical device object performs a post process and notifies it to a corresponding device class, it will eliminate self.

[0298] If correction of reference by an addition and deletion is completed, the 1394 management object 121 will notify modification of a configuration to the logical device management object 122. A notice will not be performed if there is no change in a configuration.

[0299] The logical device management object 122 which received the notice publishes a configuration change demand to each device class.

[0300] The printer class 131 which received the configuration change demand requires reference of a physical device of the logical device object 122 like initialization. It differs from initialization that only the physical device object newly added in the configuration change is applicable to all the physical device objects having been objects in initialization. Each logic device class reads the attribute of the physical device added newly, and if it judges whether it is in agreement with a self-class and is in agreement, it will generate and register a corresponding logical device object.

[0301] Completion of the configuration change of all classes registers the physical device object which initialization of an unknown class was performed and was not registered as which logical device with the added device into an unknown class.

[0302] Next, modification of an occupancy condition is explained.

[0303] In initialization, to the equipment which was judged to be in the occupancy condition by other nodes, and was excepted from recognition, the 1394 management object 121 performs periodic polling, and detects modification of a device occupancy condition by the readout of a register. The device which changed into the condition of not occupying is registered in the same procedure as change of the device configuration described by bus reset. If the PC concerned occupies said equipment exclusively, the value which shows it to the register in which the occupancy condition of equipment is shown for it will be written in.

[0304] Next, the case where a local logical device object is old is explained.

[0305] In such a case, the logic device-class object has the attribute of a version number. Application can publish the updating demand of a logic device-class object to the logical device management object 122. While the logical device management object 122 acquires the version number of the logic device-class object as which updating was required, it requires the newest version number of the archive server of the logic device-class object specified beforehand. If the version number of a local logic device-class object is in agreement with the newest thing and the version number of a local logic device-class object is young, the newest device class will be read from an archive server, and an object will be generated. This logic device-class object does not operate at this time.

[0306] If it succeeds in generation of an object, the notice of termination will be published to the existing logical device, and actuation will be terminated. If it is a printer, reception of a new print job will be stopped and it will wait for termination of the print job under activation. Completion of an active job and a post process notifies completion to the logical device management object 122. The logical device management object 122 sends the notice of initiation of a logical device to a logic

device-class object, after it changes the reference relation which an old logical device has and a new logical device object succeeds reference relation. The logic device-class object which received the notice starts actuation.

[0307] (3rd operation gestalt) The case where the remote IEEE1394 equipment to which PC (thing with the function of the 2nd operation gestalt) connected to the network was connected via networks other than IEEE1394 is controlled by this operation gestalt is explained.

[0308] The example of the structure of a system which starts this operation gestalt at drawing 30 is shown. 401, 411, and 434 express PC in the 1st home 451, network connection equipment, and a toaster, respectively. 402, 412, 431, 432, and 433 express PC in the 2nd home 452, network connection equipment, a printer, FAX, and message equipment, respectively. In addition, each component other than the network connection equipment in drawing 30 is the same as that of that to which it corresponds in drawing 1.

[0309] It shall be connected with the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452. Termination of the communication line 413 is carried out with network connection equipment 411,412.

[0310] In LAN in a home 451, 1394 buses 421 connect between the contact 411, PC401, and the toaster 434.

[0311] In LAN in a home 452, 1394 buses 422 connect between a contact 412, PC402, a printer 431, a scanner 432, and message equipment 433.

[0312] A network shall be the Internet using Internet Protocol and only PC401,402 and the contact 411,412 shall have an IP address beforehand. Although what was assigned fixed was assigned by protocols, such as DHCP and PPP, whichever is sufficient as an IP address.

[0313] Here, PC401 at a home 451 tries connection with the device of a home 452. PC401 sends the character string which shows a home 452 to network connection equipment 411 by Internet Protocol, for example, a connection request including "Yoshiaki Takahata" who is the name. And network connection equipment 411 has the database with which the telephone number of the home 452 corresponding to "Yoshiaki Takahata" is searched, and makes connection with the contact 412 of a home 452.

[0314] A contact 412 performs authentication of a connecting agency before connection. Connection shall not be made if a permission is not granted at an authentication step. Suppose authentication that the connection of those other than the telephone number registered beforehand at the 2nd home 452 is not accepted for example, using a dispatch telephone number display. If connection is completed, the communication link by Internet Protocol can be performed between homes 451,452.

[0315] However, even if connection is completed from a viewpoint of security protection, it is desirable to operate as the so-called fire wall a contact judges good/failure of passage of a packet to be by the plan of the home. Here, it shall be set up so that all packets may pass beforehand between a home 451 and a home 452 and all actuation can be performed.

[0316] In addition, this connection may be not connection but the IP connection by the telephone.

[0317] Now, PC401 at a home 451 acquires the address of a service management server from the database of a contact 411. The address shall be beforehand registered into the contact 411. Next, PC401 asks a service management server available service. Here, network connection equipment 412 shall serve as a service management server.

[0318] A service management server answers an inquiry and returns the service in the network concerned, and the information on the server. Here, the next service is registered.

[0319] printer:pc2Java The train of ORB:pc2 left expresses the multiplexing identifier (for example, port number) assigned to service the classification of service, and here, and a right train expresses the IP address of PC402 the whereabouts of service, and here. Such a service information offer means is known as a service location protocol in the Internet (for example, reference "Internet draft draft-ietf-srvloc-protocol-16.txt").

[0320] These are registered into the host who offers service, and the network connection equipment 412 with which PC402 was beforehand defined here at the time of starting.

[0321] printer expresses the printing service defined by the Internet criterion, and the UDP/TCP number of 515 is assigned. The protocol used here is beforehand prescribed by the Internet criterion.

[0322] Java ORB expresses the service which can use a Java object from the outside. Such service is Java here, although not specified as a criterion yet now. There shall be agreement beforehand about the port number showing ORB.

[0323] Next, how to use through the approach approach 2 1394 proxy object used through the network service standardized by the approach [ two kinds of ] and approach 1 Internet using 1394 equipments of RIMOTO is explained.

[0324] By the approach 1, the printer 431 connected to PC402 by the IEEE1394 interface is used by printer service standardized as Internet Protocol. PC401 has the client of a printer protocol and delivery and a printer are used for PC402 for a printing demand of the format which specified the logic name showing a printer 431 and was standardized in the Internet format. The element of device dependence is not contained in the message which transmits a network by this approach. The application of PC401 only specifies and requires the identifier of the equipment corresponding to printer service and a printer 431, and he is not conscious of the property of equipment.

[0325] Roughly, an approach 2 uses the format that the packet of an IEEE1394 format was encapsulated by the IP packet for the message which transmits a network. PC401 can be used as if the printer 431 was connected to 1394 local buses.

[0326] Hereafter, it explains in more detail about the above-mentioned approach 2.

[0327] The software structure of the service via a network before connection of a client side is shown in drawing 31, the software structure of the service via a network after connection of a client side is shown in drawing 32, the software structure of the service via a network before the connection by the side of a proxy is shown in drawing 33, and the software structure of the service via a network after the connection by the side of a proxy is shown in drawing 34. In addition, each component other than IP function in drawing 31 - drawing 34 has the same function as that to which it corresponds in drawing 2. The IP functions 504 are many functions of a series of Internet Protocol (TCP/IP protocol sheet), such as TCP/UDP/IP.

[0328] Drawing 31 is the software configuration of the client PC 401 before 1394 stub object generation. The function manager of each hard disk with which a logical device function manager and 502 have in a secondary storage function manager, and 501 has 511,512 to the subordinate of 502, 1394 interface management functions and 513,514 503 Each 1394 interface-management function, unit1,521 in 504 IP function and 434 indicate a toaster and 509 indicates toaster ability to be A 1394 management object, 522 corresponds to a logical device management object, and 531,532,533,534 corresponds to a printer, a scanner, message equipment, and each unknown logic device-class object. 534-1 is the logical device object of an unknown class. 551 expresses the physical device object corresponding to a toaster 434. 561 expresses the driver object (control program) corresponding to the physical device object 551.

[0329] Drawing 32 is the software configuration of the client PC 401 after 1394 stub object generation, and the 1394 stub object 571, the logical device object 533-1,533-2, the physical device object 551, and the driver object 562,563 are added to the configuration of drawing 31.

[0330] Drawing 33 is a software configuration by the side of [ PC / 402 ] a proxy before 1394 proxy object generation, in each 1394 interface-management function and 431, a printer and 432 express FAX and 433 expresses [ the function manager of each hard disk with which a logical device function manager and 602 have in a secondary storage function manager, and 601 has 611,612 to the subordinate of 602, and 603 / 1394 interface management functions and 613,614 ] message equipment, respectively. A 1394 management object and 622 621 A logical device management object, The logic device-class object corresponding to a printer, a scanner, FAX, and

each unknown device class in 631,632,633,634, 651 and 652,653,654,655, respectively unit1 of a printer (604 in drawing), unit1 (605 in drawing) and unit2 of FAX (606 in drawing), unit1 of message equipment (607 in drawing), The physical device object corresponding to unit2 (608 in drawing) and 631-1,631-2,632-1,633-1,634-1,634-2 are logical devices which the subordinate of logic device class has, respectively. 661,662,663 expresses the driver object corresponding to the physical device object 651,652,653, respectively.

[0331] Drawing 34 is a software configuration by the side of [ PC / 402 ] a proxy after 1394 proxy object generation, the 1394 proxy object 681, the logic device-class object 635, and the logical device object 635-1,635-2 are added to the configuration of drawing 33 , and the logical device object 634-1,634-2 is deleted.

[0332] PC401 specifies the IP address of PC402 of RIMOTO based on service information, and generates the 1394 stub object 571. A 1394 stub object is Java of PC402 of RIMOTO. The class name assigned to the 1394 proxy object is specified as an ORB port, and the generation is required.

[0333] A certain host to another host's Java When using ORB, it judges whether the security manager of a receiving side allows the connection. This shall be automatically performed by the use demand of ORB by the object of a transmitting side.

[0334] Here, the ORB use demand from PC401 should be received with PC402, in PC402, the 1394 proxy object 681 is generated as a demand, and the reference is returned to the 1394 stub object of PC402. The 1394 stub object 571 performs future demands through the 1394 proxy object 681. In addition, ORB which can use only the method which generates the 1394 proxy object 571 beforehand before PC's402 requiring, and can be started from the object concerned may be assigned to the port considered as 1394 services. This is effective to offer the service limited to 1394.

[0335] If reference is received, the 1394 proxy object 681 will gain the reference to the physical device corresponding to the logical device of an unknown class, and will notify it to the 1394 stub object 571.

[0336] If above reference is gained, the 1394 stub object 571 will register the 1394 management object itself into the 1394 management object 522, and will publish the demand which reconfigures 1394 devices.

[0337] By this demand, the 1394 management object 522 starts reconstruction by the 1394 proxy object 681, and requires the reference to a physical device object. A 1394 stub object passes the reference 654,655 to the physical object gained from 571 and the 1394 proxy object 681 in order to the 1394 management object 521. Taking out attribute value from here, the 1394 management object 521 creates the physical device object 552,553 in the same procedure as the case of initialization explained with the 2nd operation gestalt. However, the physical device object (it is hereafter called a stub device object) created here holds the reference to a remote \*\*\*\*\* physical device object, and it differs in a local physical device object in that the I/O processed as a transaction request to 1394 interfaces is processed as I/O between the 1394 stub objects 571 by the stub device object (in addition, the detail is mentioned later).

[0338] Next, initialization of the logic device-class object 533 by the logical device management object 522 and initialization of the logical device object following it are performed. The stub object 552,553 corresponds to the physical device object 654,655, and agrees in message device class. In PC402 of RIMOTO, since message device class is not used, these equipments are recognized as unknown equipment, but since message device class is registered in local PC401, it is registered as a logical device object 533-1,533-2.

[0339] If an initialization demand is given to the stub object 552 from the logical device object 533-1, the use demand of the physical device object 654 corresponding to the 1394 proxy object 681 of RIMOTO will be published.

[0340] The 1394 proxy object 681 of RIMOTO generates and registers the logic device-class



object 635 of a proxy class. The logical device object 634-1 corresponding to the physical device object 654 is eliminated, the device of a proxy class is built, and it registers as a proxy logical device object 635-1.

[0341] If the proxy logical device object 635-1 is generated, a port number will be assigned between the stub objects 533-1, and a logic connection will be generated. The port used here is Java. ORB is for transmitting 1394 packets using another port.

[0342] A control program is read, the stub object 552 side of local PC401 operates, the physical device object of PC401 of RIMOTO outputs the packet inputted from the port to 1394 interfaces, the packet inputted from 1394 interfaces is only transmitted to a port, and the control program 562 of the stub object 552 performs state control of equipment. However, events, such as bus reset, transmit.

[0343] The same is said of the case where an initialization demand is given to the stub object 553 from the logical device object 533-2.

[0344] The made environment where the physical device of RIMOTO can be used from a local logical device is ready with the above procedure.

[0345] Next, actuation is explained. Here, it explains taking the case of the physical device object 552 of a stub.

[0346] The physical device object 552 receives a processing demand from the logic device driver 531-1, and generates the packet of 1394 formats corresponding to it. The packet of 1394 formats is encapsulated by the IP packet and outputted to said logic connection who secured.

[0347] Here, the direct output of the output from the physical device object 552 is processed through the IP function 504 from a logic connection rather than it is carried out to the IEEE1394 interface 503.

[0348] Here, this may be Ethernet and ATM although the point of the IP function 504 is processed by the IEEE1394 interface. That is, PC without an IEEE1394 interface can also control as if IEEE1394 equipment was connected locally.

[0349] Now, proxy logical device OBUJIEKU 635-1 is reached, the packet of 1394 formats is taken out, and the packet encapsulated by the IP packet is passed to the physical device object 654. Physical device OBUJIEKU 654 outputs this to 1394 interfaces as it is, and acts on the register of equipment 433.

[0350] I/O of the isochronous channel of IEEE1394 cannot be relayed by the above-mentioned approach. An isochronous channel is set up by operating a register by the method defined by IEC 1883 in IEEE1394.

[0351] The setting demand of IEC1883 published by self-equipment from the stub object 552 is transmitted 1394 stub object 571, and the 1394 stub object 571 sets up the connection on the Internet corresponding to an isochronous channel.

[0352] The band to secure can be specified by the isochronous channel of IEEE1394. Since the information is included in the above-mentioned setting demand, it is desirable to specify a connection's band with a means, for example, means, such as RSVP, to secure a band on the Internet.

[0353] In addition, although connected with this operation gestalt by the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452 Connection between LAN in a home 451 and LAN in a home 452 is made the Internet like the 1st operation gestalt. In this case, may make it use a global IP address for the IP address of a terminal, and For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node ( drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes.

[0354] In addition, each above function is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0355] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0356] The service provision equipment with which it held in the 2nd home network to the 1st AV contact 4 with the 1st operation gestalt as shown in drawing 12 (4th operation gestalt) (For example, the WWW server, the digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) The case where a service location protocol was used although the information (it is hereafter called service information simply) about the service which a printer 11 offers is notified was shown.

[0357] The 4th operation gestalt explains the case where this is performed with a WWW (World Wide Web) server using a homepage.

[0358] The example of a system configuration in the 4th operation gestalt is the same as that of drawing 1. Here, it considers performing remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) from the 1st AV contact 4 of the 1st domestic network like the 1st operation gestalt.

[0359] Drawing 35 is the thing in the 4th operation gestalt which showed the example of an internal configuration of the 2nd AV contact 5, actuation of each part of 1394 I/F1401, the data link switch 1402, public network I/F1403, the IP processing facility 1404, the FANP processing facility 1405, and the 1394AV command-processing function 1408 is the same as that of the same function part of drawing 2, and a different point is explained. That is, the service location processing facility 27 of drawing 2, and 1394 / IP command conversion function 29 are transposed to the homepage processing facility 1407 and the HTTP/RTSP processing facility 1409 by drawing 35, respectively.

[0360] The 1394/IP service location processing facility 1406 has the function which notifies service information outside if needed, when it has recognized what kind of service the service which the service provision equipment connected to the IEEE1394 bus offers like the 1st operation gestalt is searched, or the registration is received, and what kind of service provision equipment exists on 1394 buses, and is offered and it is required. Moreover, it notifies to the homepage processing facility 1407 which mentions later the service information for every service provision equipment obtained by doing in this way, and creation of the homepage which displays the situation of the 2nd domestic network is urged.

[0361] The homepage processing facility 1407 has WWW server ability. From the 1394-/IP service location processing facility 1406, reception and it are summarized for the service information on the 2nd domestic network as a homepage. For example, the icon and character string showing each service provision equipment are arranged on a homepage. And it is made to link to the icon and character string showing each service provision equipment on the homepage corresponding to each for the command for carrying out remote control of each service provision equipment. Thus, when the created homepage has access through a public network 2, the homepage demanded if needed is transmitted or the command for remote control received through the public network 2 is transmitted to the HTTP/RTSP processing facility 1409. It mentions later for details.

[0362] Here, with the command for carrying out remote control of the service provision equipment, it is suitable for HTTP or RTSP (protocol for operating the real-time media in a WWW server by remote control). The command for remote control which was suitable for the HTTP command and RTSP in the command for remote control suitable for HTTP is called the RTSP command.

[0363] The HTTP/RTSP processing facility 1409 has the HTTP demon or the RTSP demon inside. With the function to perform processing to the HTTP command or the RTSP command transmitted from the homepage processing facility 1407. In being what is assigned to the service which the 2nd AV contact 5 serves as a substitute, and the destination of the command exhibits It is changed into an IEEE1394 command if needed, and it also has the function (substitute processing) which controls the device on 1394 buses 3 through the 1394AV command-processing function 1408.

[0364] Next, in the 2nd domestic network, the procedure which acquires the service information on

each service provision equipment that the 2nd AV contact 5 was connected to the 2nd domestic network is explained. This is the same as that of the 1st operation gestalt. That is, as shown in drawing 3 , the 2nd AV contact 5 is with reading the configuration memory of the connected device (the DVD player 8, digital VTR 9, PC10, printer 11), and using a service location protocol, as shown in drawing 9 , and acquires the service information on the service provision equipment connected to the 2nd domestic network.

[0365] In addition, the information included in configuration memory may have drawing 4 , drawing 5 , and a thing like drawing 6 . Moreover, service information may be registered in the format shown in drawing 10 .

[0366] Now, the 2nd AV contact 5 recognizes the DVD player 8, digital VTR 9, PC10, and a printer 11 as 1394 nodes through reading of configuration memory at this time. Moreover, each of WWW service, digital album service, Aircon Service, and microwave oven service is further recognized through a service location protocol. Here, it is recognized as it being the service which is provided with the 2nd AV contact 5 and provided with Aircon Service and microwave oven service with PC10.

[0367] Now, the 2nd AV contact 5 creates the homepage "introduces what there is in that house (what kind of service [ what kind of service provision equipment and ] exist?)" based on these collected service information.

[0368] The homepage created enumerates icons, character strings, etc. showing them for every service provision [ to make it recognize / a user ] equipment, as shown in drawing 36 R> 6. This homepage may build this so that it can reach by the hyperlink from an icon in a saying in the first homepage which the WWW server of that house introduces by the default, for example (for example, "the electrical machinery and apparatus of my home") character string. Incidentally, in case it moves to the homepage of this "electrical machinery and apparatus of my home", passing through a certain authentication procedure is desirable so that it may not be invaded by others who have not got authorization.

[0369] When the icon in a homepage as shown in drawing 36 , and a character string are clicked, it is made for the service provision equipment corresponding to it or the homepage for every service to appear. For example, you may make it a click of the icon of the DVD player of drawing 36 display "the homepage of a DVD player" as shown in drawing 39 linked to it.

[0370] In order to create a homepage as shown in drawing 36 of such a configuration, the homepage processing facility 1407 completes a procedure as shown in the flow chart of drawing 37 .

[0371] First, it reads one [ at a time ] the service information registered into 1394 / IP service location processing facility 1406 for example, for every service provision equipment, and the homepage (for example, "homepage of a DVD player" as shown in drawing 39 ) for every service provision equipment is created (step S101 - step S102).

[0372] The flow chart shown in drawing 38 shows the homepage creation procedure for every service provision equipment of step S102.

[0373] With reference to the table 1410 (refer to drawing 50 ) corresponding to a RTSP command for every service provision equipment provided in 1394 / IP service location processing facility 1406, the command group (command group for control of the service provision equipment which lets a homepage pass and is opened to a user) as which each service provision equipment was determined beforehand is acquired (step S111), and the icon or character string corresponding to it is created for every command (step S112). For example, when service provision equipment is a DVD player, the RTSP command "PLAY" for directing "playback" is acquired from the table corresponding to a RTSP command of drawing 50 R> 0, and the icon (icon i206 of drawing 39 ) corresponding to the command is created.

[0374] As for the table 1410 corresponding to a RTSP command, the RTSP command is described for every service provision equipment. For example, in the case of the DVD player 8, as a command

group, each RTSP command of power-source ON, power-source OFF, playback, rewinding, front music, a rapid traverse, the following music, a halt, and a halt is mentioned. Moreover, the case of the DVD player 8 which is performing substitute processing with the 2nd AV contact 5, and digital VTR 9 is having both 1394 commands corresponding to each RTSP command memorized as shown in drawing 50.

[0375] In addition, the table 1410 corresponding to a RTSP command may be the same as the table provided in 1394 / IP command conversion function 1423 of drawing 42 mentioned later.

[0376] Now, the RTSP command of the service provision equipment is matched with the icon or character string created at step S112 (step S113). For example, the RTSP command "PLAY" is made to correspond to the icon i206 of "playback" of drawing 39. For example, an icon or a character string, and the RTSP command corresponding to it may be registered into a table.

[0377] in addition, the case of the DVD player 8 which is performing substitute processing with the 2nd AV contact 5, and digital VTR 9 -- the address of the 2nd AV contact 5, the DVD player 8, and digital VTR 9 -- the port number assigned to each IEEE1394 node is included in the RTSP command.

[0378] The homepage of service provision equipment as performed the above to all the commands that the service provision equipment offers, and arranged the created icon or character string suitably, for example, shown in drawing 39 is created (step S114 - step S115).

[0379] Next, the icon or character string of the service provision equipment with the hyperlink to the homepage for every service provision equipment created by explanation of drawing 37 according to the flow chart of return and drawing 38 is created or acquired (step S103). That is, the icon for every service provision equipment etc. may be taken out from the configuration memory of that service provision equipment, and may come to hand in the form which goes for URL which can be specified as a meaning to be offered by the service location protocol, and to take the location of this icon with it there.

[0380] The icon obtained at step S103 is stuck on the homepage of "the electrical machinery and apparatus of my home." It holds in the 2nd domestic network, the above procedure is performed about the service provision equipment of all \*\*\*\*\*, and a homepage like drawing 36 can create it (step S104).

[0381] Now, if it clicks on the icon i101 which expresses a DVD player among the icon showing the service provision equipment on the homepage shown in drawing 36, or a character string, the homepage of the service provision equipment matched with this icon, i.e., the homepage of a DVD player as shown in drawing 39, will appear.

[0382] The homepage of a DVD player can be used as a control panel of a DVD player in the homepage of service provision equipment as shown in drawing 39, i.e., this case, and a user can do remote control of the DVD player 8. For example, when a "power-source ON" carbon button is clicked, it is condition that the power source of the DVD player 8 is turned on.

[0383] Next, it explains with reference to the sequence diagram showing the processing actuation in the case of carrying out remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10), through the 1st AV contact 4 and a public network 2 from PC6 of the 1st domestic network in drawing 4040, for example.

[0384] Suppose that the homepage as shown in drawing 36 was shown by using a predetermined WWW browser with PC6 held in the 1st domestic network. The HTTP message as which he will demand the homepage of the DVD player by which the correspondence price was carried out to it if a user clicks on the icon of the DVD player i101 is outputted from PC6.

[0385] In response to this message, the sending-out demand of the homepage of DVD is performed to the 2nd AV contact 5 with the 1st AV contact 4 (step S4501). For example, the message "GET/appliances/dvd.html HTTP/1.1" is transmitted to the 2nd AV contact 5 from the 1st AV contact 4.

[0386] In response, the 2nd AV contact 5 sends the text (refer to drawing 41 ) of the homepage of a DVD player as shown by drawing 39 to the 1st AV contact 4 (step S4502).

[0387] As shown in drawing 41 , the hyperlink given to the "reproductive" icon i206 is the "PLAY" command of RTSP for directing playback, and the node used as the connection place, in the case of this operation gestalt the IP address of the 2nd AV contact 5, i.e., "192.168.1.254", and its port number (in the case of this operation gestalt "2000") are added. If it clicks on the "reproductive" icon i206 by doing in this way, a user can send out the "PLAY" command of RTSP to the port of a request of a desired node, without caring about the address of a transmission place. It can have and remote control using RTSP can be performed now through correlation of a hyperlink.

[0388] Now, the user of 1st AV contact can start remote operation of a DVD player, if the homepage of DVD is received. For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4503). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport : It is with rtp/udp;port=5500" and command data are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4504). With this command data, the 1st AV control device 4 transmitted data using each protocol of RTP/UDP, and is requiring that the port number of a receiving side should use "5500."

[0389] Actuation of the 2nd AV contact 5 which received this is explained below. The example of an internal configuration of HTTP / RTSP processing facility 1409 of 2nd AV contact is shown in drawing 42 . The "SETUP" command data of Above RTSP reach the HTTP/RTSP main processing facility 1421. Here, first, among "SETUP" command data, it recognizes that a port number "2000" is a port number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0390] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4505).

[0391] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4506). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below.

[0392] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4507). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number "2000", session number "1234") matched by this hyperlink (step S4508).

[0393] It executes the "PLAY" command to reservation (step S4509) of the synchronous channel by IEC1883, and the DVD player 8 of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this (step S4510), and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it. And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session:1234") of RTSP to the 1st AV contact 4 (step S4511 - step S4512).

[0394] Then, the 2nd AV contact 5 carries out IP capsulation of the image data sent through this synchronous channel, and sends them out to the 1st AV contact 4 as an IP packet (step S 4513-

4515).

[0395] The 1st AV contact 4 receives the above-mentioned image data as an IP packet, and performs required processings, such as a display of an image. When making the sending-out place of an image digital [ TV / 7 ] Reservation of the required synchronous channel on IEEE1394 which is the 1st domestic network, and the 1st AV contact 4 receive digital [ 7 ] one TV like the 1st operation gestalt. What is necessary is just to send out to the 1st domestic network, after taking out the above-mentioned image data from a receiving IP packet after directing a display on the screen of the data reception and its data from this synchronous channel, and changing into the format for IEEE1394.

[0396] In addition, even when the user clicks on the "reproductive" icon i206 before clicking on the icon i201 of the "power source ON" of the homepage of drawing 39, the user judges that there is volition of actuation of the DVD player 8, and sends out both the "SETUP" command and the "PLAY" command in response to the click of the "reproductive" icon i206.

[0397] Moreover, when opening the homepage of a DVD player, the "SETUP" command of a DVD player is sent out as a RTSP command.

[0398] It is based on the service information collected from all the service provision equipments in which remote control held in the 2nd domestic network is possible as explained above. The 2nd AV contact 5 With reference to the table 1410 corresponding to a RTSP command, the RTSP command of each service provision equipment and the homepage which carries the linked icon are created. When it clicks on a desired icon by the 1st AV contact 4 side which accessed this homepage, The RTSP (it registers with table of 1394-/IP command conversion function 1423 of HTTP/RTSP processing facility 1409) command matched with the icon by the hyperlink By being changed into 1394AV(s) / C-command, and performing desired control to desired service provision equipment Remote control will become possible even when the service provision equipment (for example, DVD player 8) connected to the 2nd physical network (for example, IEEE1394 bus 3) can interpret only the protocol depending on a data link layer (if AV contact of this invention is used).

[0399] Now, the above explained the case where the 2nd AV contact 5 encapsulated and sent out image data to an IP packet. On the other hand, the 2nd AV contact 5 does not perform IP capsulation, but how to send out image data to the 1st AV contact 4 with non-IP data is also considered. In this case, it explains with reference to the sequence which is attached and is shown in drawing 43.

[0400] The user of the 1st AV contact 4 of step S4801 - step S4802 is the same as that of explanation of drawing 40 until he begins remote operation of reception and a DVD player for the homepage of a DVD player.

[0401] For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4803). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport: The "SETUP" command data of RTSP called iec1883 / nonip;port=FANP" are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4804). It is being required that the 1st AV control device 4 should encapsulate data in IEC1883, and should transmit them with this command data in the form which is not an IP packet (the information of "iec1883/nonip" for directing non-IP packet-ization is included in [SETUP [ namely, ]" command of RTSP). Moreover, in order to know the link layer information and attribute information on the data transmitted, it is being required from the 2nd AV contact 5 that the above-mentioned information should be notified to the 1st AV contact 4 using FANP.

[0402] The "SETUP" command data of RTSP are received by the HTTP/RTSP processing facility 1409 of the 2nd AV contact 5, and reach the HTTP/RTSP main processing facility 1421.

[0403] In the HTTP/RTSP main processing facility 1421, it recognizes that a port number "2000" is a number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0404] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4805).

[0405] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4806). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below. The session number which a browser holds is updated by reference of the hyperlink corresponding to termination of the explicit session by the user, for example, session termination, termination of the session by the 2nd AV contact 5 by the side of opposite, or reloading of a page.

[0406] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4807). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number "2000", session number "1234") matched by this hyperlink (step S4808).

[0407] It executes the "PLAY" command to reservation (#X) of the synchronous channel by IEC1883, and the DVD player of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this, and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it (steps S4809-S4811). And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session: 1234") of RTSP to the 1st AV contact 4 (step S4811 - step S4812).

[0408] Then, IP capsulation does not perform the image data sent through this synchronous channel (#X), but the 2nd AV contact 5 encapsulates a public network as it is, and sends it out to the 1st AV contact 4. For example, as long as a public network is an ATM network, IEC1883 packet transmitted to the 2nd AV contact 5 may be mapped and sent out to an ATM network as it is, IEC1883 packet may be removed once, and the image data itself may be mapped and sent out to an ATM network. make it any -- in order to notify the header information of the link layer which the 2nd AV contact 5 sends out to the 1st AV contact 4, a FANP message "FANP message (ch: #y, Session:1234)" is sent out (step S4813).

[0409] In order to clarify that how to use a FANP message is FANP corresponding to the session number notified in step S4812 although it is the same as that of the 1st operation gestalt fundamentally, the session number (in the case of this operation gestalt "1234") of the same value as the value notified at step S4812 may be contained in this FANP message. By making it this appearance, the receiving-side node 4, i.e., 1st AV contact, can recognize that a FANP message is a thing corresponding to the "PLAY" command of said RTSP.

[0410] Now, if the image data sent by the synchronous channel (#X) from the DVD player 8 are outputted to a public network 2 in the 2nd AV contact 5, without carrying out IP capsulation, required processings, such as a display of an image, will be performed in the 1st AV contact 4 which received it (steps S4814-S4816). As it is in step S4815 in that case, MPEGover1394 to MPEGoverATM etc. may perform required format conversion, when the data transmission approach depending on the network transmitted is specified. Moreover, when making the sending-out place of an image digital [ TV / 7 ], it is also the same as that of the above-mentioned case.

[0411] Although the above operation gestalt [ 4th ] has explained the case where the RTSP command for carrying out remote control of the service provision equipment to the icon or

character string in a homepage is made to correspond in a hyperlink To the icon in the homepage corresponding to each RTSP command, or each of a character string, instead of making it correspond in a hyperlink When the program (for example, JAVA (trademark) program) for creating corresponding RTSP command data is stuck and the icon or character string is clicked The RTSP command which starts this program with the 1st AV contact 4 (for example, JAVA virtual machine on the 1st AV contact 4), and was explained by drawing 40 or drawing 43 is sent out.

[0412] The processing actuation in this case is the same as that of drawing 40 and drawing 43 , and text description of the homepage of the service provision equipment transmitted from the 2nd AV contact 5 at step S4504 of drawing 40 and step S4802 of drawing 43 differs.

[0413] An example of the text of the homepage of service provision equipment is shown in drawing 44 . The program which is the text of the homepage of a DVD player, for example, generates the RTSP command to the icon i206 of "playback" of drawing 39 is added to drawing 44 .

[0414] Too, if it clicks on the "reproductive" icon i206 also in this case, by starting the program which generates the "PLAY" command of RTSP, that command can be sent out now to the port of a request of a desired node, it can have it in it, and remote control of the service provision equipment using RTSP can be carried out.

[0415] Next, the icon (carbon button) i210 of "a detail setup" of the homepage of drawing 39 is explained. This carbon button is used to perform actuation finer than remote control beforehand defined by the RTSP command to target service provision equipment (for example, DVD player 8). That is, the control command of the DVD player 8 specified with the AV/C protocol of IEEE1394 may be various from the command specified by RTSP. Thus, if the homepage which performs this is separately set up as a cure in the case of the ability to respond to no commands of 1394 AV/C by the RTSP command and the carbon button of "a detail setup" of drawing 39 is pushed, it was matched with it, for example, the command "GET /appliances/dvd\_detail.html HTTP/1.1" will be sent out and the homepage for a detail setup of a DVD player as shown in drawing 47 will be sent.

[0416] Drawing 45 shows the creation procedure of the homepage for a detail setup of service provision equipment. That is, the table corresponding to the native command which registered the command (native command) depending on the link layer method (AV/C protocol of IEEE1394 when it is this operation gestalt) of the service provision equipment on which correspondence is not made on the command table 1410 for every above-mentioned service provision equipment is separately provided in 1394 / IP service location processing facility 1406. With reference to a native command table, a native command is acquired for every service provision equipment (step S121), and the icon or character string corresponding to it is created for every command (step S122). A CGI (Common Gateway Interface) script is matched with the generated icon or character string (step S123). The homepage for a detail setup of service provision equipment as performed the above to all the native commands of the service provision equipment, and arranged the created icon or character string suitably, for example, shown in drawing 47 is created (step S124 - step S125).

[0417] In addition, the table corresponding to a native command may be the same as the table in the CGI processing facility 1424 provided in the HTTP/RTSP processing facility shown in drawing 42 .

[0418] Some carbon buttons (an icon or character string) arranged at the homepage for a detail setup of the DVD player of drawing 47 are matched with the CGI script processed by the CGI (Common Gateway Interface) processing facility in the 2nd AV contact 5. And each CGI script is the script which sends out AV/C-command of corresponding IEEE1394 to the IEEE1394 bus of the 2nd domestic network, and it has, and if the above-mentioned icon or a character string is clicked, grain size defined with the AV/C protocol can be controlled.

[0419] Thus, if the homepage for a detail setup is created and the icon or character string in the homepage is clicked, the demand message for starting the CGI script in the 2nd AV contact 5 which swerved, and was been and matched is transmitted in HTTP, in response to it, with the 2nd



AV contact 5, this CGI script will be started and a corresponding AV/C command will be published. [0420] the thing to which drawing 46 is transmitted from the 2nd AV contact 5 and which showed an example of text description of the homepage for a detail setup of a DVD player, for example -- it is -- the character string of "slow playback" of drawing 47 -- a CGI script -- correspondence -- the price -- the \*\*\*\*\* case is shown.

[0421] Although the RTSP command will be published like step S4508 of the above-mentioned drawing 4040 if it chooses "usually reproducing" by the homepage for a detail setup of the DVD player of drawing 47 About the command which is not supported by RTSP, such as "language selection" and "slow playback" In the CGI processing facility 1424 provided in the HTTP/RTSP processing facility of the 2nd AV contact 5, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0422] For example, when "slow playback" is chosen by the homepage shown in drawing 47, the message "dvd/slowplay.cgi HTTP [ GET http://192.168.1.254/]/1.1" for starting the CGI script corresponding to this is turned and sent out to the 2nd AV contact 5. In the 2nd AV contact 5 which received this, since the command of "slow playback" is not supported by RTSP, in the CGI processing facility 1424 provided in a HTTP/RTSP processing facility, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0423] It is easy to be natural, even if the icon or character string corresponding to the RTSP command, and the icon or character string corresponding to a CGI script may be intermingled in the homepage for a detail setup of service provision equipment and the homepage consists of only the icons or character strings corresponding to a CGI script. For example, "playback" carbon button of drawing 47, the carbon button of "a power source ON" and "a power source OFF", etc. may be realized by a JAVA program etc. in the hyperlink about the command in the table corresponding to a RTSP command, and you may realize in CGI about other detail commands, such as "selection language" and a "title."

[0424] moreover, all the carbon buttons arranged at the homepage for a detail setup of drawing 47 are registered into the table corresponding to a native command -- having -- \*\*\*\* -- a CGI script -- correspondence -- the price -- \*\*\*\*\* -- it is good.

[0425] As mentioned above, although the 4th operation gestalt has described remote control of the AV equipment according to the AV/C command on an IEEE1394 bus, same control can be similarly performed about the device which has a protocol group depending on the link layer of other arbitration. The case where LON which is a kind of a home automation network is applied as the example is explained.

[0426] Drawing 48 and drawing 49 show the example of an internal configuration of AV contact which connects LON, respectively, and the example of a configuration of a HTTP/RTSP processing facility.

[0427] the point which can send out now command groups, such as the command group defined by LON, for example, LONTalk etc., instead of the AV/C command of IEEE1394 -- difference -- it is a point and each other configuration sections are the same as that of the above-mentioned.

[0428] In addition, each function explained with the 4th operation gestalt above is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0429] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0430] (5th operation gestalt) Drawing 51 is what showed the example of a configuration of the communication system concerning the 5th operation gestalt of this invention, and the 1st network (for example, home network which consists of IEEE1394 buses) 2010 and 2nd network (for example,

Internet on a public network 2101) interconnect through the AV contact 2201. Hereafter, the 1st network 2010 is called a home network 2010, and the 2nd network 2101 is called the Internet 2101. Moreover, each terminal unit connected to the home network 2010 presupposes that it is an information appliance with the Internet processing facility.

[0431] The AV contact 2201 has the role of the Gateway which connects a home network 2010 and the Internet 2101, and it has the termination function of a home network or the Internet, router ability, a protocol conversion function, substitute server ability, etc. so that it may mention later.

[0432] The personal computer (PC) 2001, the printer 2002, and the DVD player 2003 are connected to the IEEE1394 bus which constitutes a home network 2010. The IP terminal 2102 which can perform IP communication link is connected to the Internet 2101. Of course, terminal units other than the above may be connected to a home network 2010 and the Internet 2101.

[0433] In drawing 51, all terminal units are terminal units which can have an Internet terminal, i.e., an IP address, and can perform IP communication link. However, the IEEE1394 bus which constitutes a home network 2010 is employed in the address of private IP address space, and the Internet 2102 is employed in global IP address (for example, IPv4) space. The IP address of the IP terminal 2101 presupposes that it is "G. 2." On the other hand, as the address of each equipment on a home network 2010, it has the private subnet address "P. 0", and PC2001 presupposes that "P. 1" and a printer 2002 are [ "P. 2" and the DVD player 2003 ] "P. 3."

[0434] Since it connects with these [ from which an address system differs ] two networks, the AV contact 2201 has the address of two different address systems. That is, the IP address by the side of a home network 2010 presupposes that the IP address by the side of the Internet 2101 is "G. 1" by "P. 254."

[0435] Drawing 52 shows the example of a configuration of the AV contact 2201. The AV contact 2201 A home network 2010 The Internet interface 2205 which manages the interface for accessing 1394 interfaces (I/F) 2202 and the Internet 2101 which manage the interface for connecting with the IEEE1394 bus to constitute (I/F), The service in IP processing section 2202 which performs routing processing of the Internet packet, address translation between a global IP address and a private IP address, etc., and a home network 2010 is detected. The equipment on the service location substitute processing section 2203 which collects and presents these services through the homepage processing section 2204 to the Internet 2101 side (advertisement), and a home network 2010, About service, the homepage which can perform remote control from the Internet 2101 side is generated, and it consists of the homepage processing sections 2204 which deliver this according to a demand.

[0436] IP processing section 2202 possesses the NAT processing section 2206 which performs address translation processing. NAT is the abbreviation for network address translation (translation), and, generally transform processing between a global IP address and a private IP address or transform processing of the IPv4 address and the IPv6 address is performed. For details, please refer to RFC1631.

[0437] The NAT processing section 2206 also has the address translation function of the port unit called an IP masquerade. Namely, even if many terminal units are in a home network 2010 side It is the technique which will be made enough if there is one global IP address (G. "1" when it is this operation gestalt) required for the Internet 2101 side. Specifically Each terminal unit connected to the home network 2101, As opposed to the logic multiplex identifier (the logic multiplex identifier of the service identified in the port number specified by RFC1340 is a port number) of each service (for example, service identified in the port number specified by RFC1340) Other separate logic multiplex identifiers (for example, port number specified by RFC1340) are assigned for every service with the same global IP address "G. 1." It memorizes as a table (address port number translation table 2207) as shows these correspondence relation to drawing 55. And the communication link of the terminal unit on the Internet 2101 and the equipment on a home network 2010 is mutually attained by changing into the address and the port number of a mutual address

space the destination address of the packet transmitted to another side from either the Internet 2101 and the home network 2010 using this table 2207, and being transmitted.

[0438] IP processing section 2202 possesses a packet filter 2208 further. A packet filter 2208 has a function as the so-called firewall. That is, as the packet (or packet which may pass) which should pass the AV contact 2201 and which does not come out is distinguished and this is not passed to other parts other than IP processing section 2202 about the packet which should pass and which does not come out (for example, it discards), access to a home network 2010 from the outside is restricted. This prevents beforehand access to the service on the home network 2010 by the malicious user. For this decision processing, a packet filter 2208 has the table (packet filter table 2209) which passed the AV contact 2201 and registered the source address of the packet which can be sent out to a home network 2010, and when the source address of the packet inputted from the Internet 2101 is registered into this table, it permits that passage. In addition, the source address which does not pass the AV contact 2201 may be registered into the packet filter table 2209. In this case, if the source address of the packet inputted from the Internet 2101 is not registered into this table, it permits passage of that packet.

[0439] Next, the case where access a home network 2010, for example, the DVD player 2003 is operated by remote control from the IP terminal 2102 on the Internet 2101 with reference to the sequence shown in drawing 53 is taken for an example, and processing actuation of the AV contact 2201 is explained.

[0440] First, the service location substitute processing section 2203 of the AV contact 2201 collects the service location information on a home network 2010 (step S5001 – step S5003). Service location information is information which shows what kind of service or terminal unit exists on a home network 2010. Some approaches can be considered as an approach of collecting service location information. For example, although various approaches, such as an approach using a service location protocol, an approach using LDAP (lightweight directory access protocol), an approach using DHCP (dynamic host configuration protocol), and an approach using MIB (management information base) of SNMP (simple network-control protocol), can be considered, which these approaches may be used.

[0441] Here, the service location information on a home network 2010 shall be collected, for example using a service location protocol as shown in drawing 12. In addition, refer to RFC2165 for the detail of a service location protocol. Like drawing 53, the AV contact 2201 serves as a directory agent of a home network 2010, and collection of actual service location information may register each service to the AV contact 2201 from each service agent (namely, PC2001, a printer 2002, the DVD player 2003).

[0442] In addition, the AV contact 2201 sends out a service request to IP multicast address beforehand assigned to each service about the service which can support the AV contact 2201 besides such an approach, and you may make it the terminal unit itself which offers the service concerned answer to this demand. Moreover, you may make it ask the directory agent the AV contact 2210 recognizes [ an agent ] separate existence on a home network 2010 the detail of service on a home network 2010.

[0443] Based on the information (port number of the service specifically offered by the address and the equipment concerned of a terminal unit on a home network 2010 (RFC1340 prescribes)) about the service currently offered on the home network 2010 collected here, processing actuation as shown in the flow chart of drawing 54 is performed.

[0444] The AV contact 2201 creates the homepage explaining what kind of service and terminal unit exist in owner (for example, referred to as Mr. A) \*\* of a home network 2010 in the homepage processing section 2204 (step S5101 – step S5102).

[0445] This homepage is a homepage displayed to access URL (Uniform Resource Locator), "http://G.1", of A Mr. \*\* from the terminal unit of the arbitration on the Internet 2101 as shows drawing 59. [ i.e., ] It is the user interface which can operate each service which exists in A Mr. \*\*,

and a terminal unit by the CGI (Common Gate Way) program from this homepage, for example. If the link is stretched to each terminal unit on a home network 2010 and that object is clicked from this homepage in fact, next it connects with the homepage of each terminal unit, and has become the structure as which the homepage which becomes possible [ operating the actuation switch of that terminal unit which each terminal unit offers by remote control ] is displayed.

[0446] Next, the service location substitute processing section 2203 assigns the port number (well not a NOUN port number but the port number which can be set up dynamically) specified by the original logic multiplex identifier 1340, i.e., RFC, about each of the service collected previously or a terminal unit (step S5104). It sets from the first on a home network 2010, and a \*\*\*\*\* port number calls the port number to which it sets from the first on a home network 2010 and to which a \*\*\*\*\* port number is hereafter assigned uniquely in the service location substitute processing section 2203 to the service on the 1st port number, a call, and a home network 2010 the 2nd port number, in order to distinguish.

[0447] For example, the 2nd port number "2000" is assigned so that the 2nd port number "2002" may tell it a printer 2002 and the 2nd port number "2004" may tell PC2001 to the DVD player 2003. This 2nd port number becomes the global IP address and group of the AV contact 2201, and is employed. That is, from the Internet 2101 side, when the 2nd port number "2000" is accessed, this will interpret the AV contact 2201 as it being access to the DVD player 2003. In addition, if a logic multiplex identifier is an identifier which can identify on the Internet each service offered not only the port number specified by RFC1340 but on a home network 2010, it is good anything.

[0448] The correspondence relation between the global unique IP address of the AV contact 2201, the 2nd port number assigned to each service offered on a home network 2010, the 1st port number as a logic multiplex identifier to the service concerned on a home network 2010, and the private IP address of equipment which offers the service concerned is registered into the table 2207 corresponding to an address port number (step S5105).

[0449] The example of the table 2207 corresponding to an address port number is shown in drawing 55. The IP address by the side of the Internet 2101 (global unique IP address), the IP address by the side of the 2nd port number and a home network 2010 (private IP address), and the pair of the 1st port number are registered into the table 2207 corresponding to an address port number for each [ are provided on a home network 2010 ] the service of every. Sequential registration of the correspondence relation about all services with which this table 2207 is provided on a home network 2010 is carried out.

[0450] For example, in the case of the DVD player 2003, to the Internet 2101 side, the 2nd port number "2000" is assigned to service (IP address (private IP address) =P.3, the 1st port number = interpreted as it being the http service offered by the DVD player by 80 by the service location protocol) of the DVD player within a home network 2010 by the global IP address "G. 1" of the AV contact 2201.

[0451] Creation of such an address port number translation table 2207 is performed about each of service of A Mr. \*\*. About this each, description to the homepage of A Mr. \*\* is performed.

[0452] About all services of A Mr. \*\*, after the registration to a table 2207 finishes, creation of the address port number translation table 2207 and creation of the homepage of A Mr. \*\* are completed (step S5106).

[0453] Now, the created address port number translation table 2207 is used in case an IP packet passes through the inside of the AV contact 2201, and an IP address and transform processing of a port number are performed. With reference to drawing 58, transform processing of the IP address and port number using the address port number translation table 2207 is explained concretely. For example, by referring to a table 2207, an IP packet [ as / the Internet 2101 side to whose destination IP address is "G. 1" / whose destination port number is "2000" ] is changed into an IP packet [ as / whose destination IP address is "P. 3" / whose destination port number is "80" ], and is sent out to a home network 2010 side. On the contrary, a transmitting agency IP address is

changed into an IP packet [ as / "G. 1" and whose transmitting agency port number are "2000" ], and, as for an IP packet [ as / "P. 3" and whose transmitting agency port number are "80" ], a home network 110 side to a transmitting agency IP address is sent out to the Internet 2101.

[0454] Now, such an address port number translation table 2207 and the AV contact 2201 which ended creation of the homepage of A Mr. \*\* exhibit this homepage on the Internet 2101 as a homepage of A Mr. \*\* (refer to drawing 59 ).

[0455] Next, the user of the IP terminal 2102 on the Internet 2101 explains the case where the DVD player 2003 of A Mr. \*\* is operated by remote control.

[0456] Processing actuation of the AV contact 2201 at the time of receiving an IP packet for processing actuation of the AV contact 2210 at the time of receiving an IP packet from the Internet 2101 side from a home network 2010 side to drawing 56 is shown in drawing 57 . Hereafter, it explains with reference to the flow chart shown in drawing 53 , drawing 56 - drawing 57 .

[0457] First, the IP terminal 2102 performs authentication procedure in order to require sending of the homepage of A Mr. \*\* from the AV contact 2201 (step S5004 of drawing 53 ). For example, to the user of the IP terminal 2102, a password input etc. is required and the IP address of the IP terminal 2102 is registered into the above-mentioned packet filter table 2209 only about the user attested by this.

[0458] Access only of the IP address which the packet filter table 2209 is a table of only having only enumerated IP addresses, and is registered into this table to the service offered on a home network 2010 and a home network 2010 is attained.

[0459] Next, the IP terminal 2102 requires sending of the homepage of A Mr. \*\* from the AV contact 104 (step S5005). It checks (step S5006), when the source address concerned is registered into the packet filter table 2209, it restricts whether the source address of the packet of a sending demand of the homepage concerned is registered into the packet filter table 2209 by the packet filter 2208, and the packet concerned is passed to the homepage processing section 2204, and the homepage processing section 2204 sends the homepage of A Mr. \*\* to the IP terminal 2102 according to the demand concerned (step S5007).

[0460] As shown in drawing 59 R> 9, the link to each homepage of the DVD player 2003 on a home network 2010, a printer 2002, and PC2001 is attached to the homepage sent here. For example, it is linked to the alphabetic character or picture on the homepage of drawing 59 a "DVD player" to the DVD player 2003. The address of an actual link place serves as the 2nd port number "2000" of the global IP address "G. 1" of the AV contact 2201, and the format top serves as a substitute server for the AV contact 2201 to access to the equipment on a home network 2010. Of course, this is not recognized from the IP terminal 2102. However, the processing which the AV contact 2201 actually performs unlike substitute server processing is IP masquerade processing, i.e., an IP address and transform processing of a port number, like the after-mentioned.

[0461] Now, the user of the IP terminal 2102 sends out the sending-out demand of the homepage of a DVD player so that he may operate the DVD player 2003 by remote control. For example, the IP packet of a sending-out demand of the homepage of a DVD player is sent out by clicking the alphabetic character or picture on the homepage shown in drawing 59 a "DVD player." A destination IP address is [ "G. 1" and the destination port number of the destination of this packet ] "2000" (step S5008).

[0462] This IP packet is explained with reference to the flow chart shown in drawing 56 about packet filtering and address port number transform processing to the processing actuation S5009, i.e., the step of drawing 53 , when the AV contact 2201 receives - step S5010.

[0463] The AV contact 2201 will perform packet-filtering processing with reference to the packet filter table 2209 first, if it checks that it is addressing to itself with reference to the destination address of the IP packet which received (step S5201) (step S5202). If the source address of the packet concerned is registered into the packet filter table 2209 next, it will be confirmed whether the group of the destination IP address of the packet concerned and a destination port number is

registered into the address port number translation table 2207 (step S5203). If registered, according to the address port number translation table 2207, the destination IP address concerned and a destination port number are substituted for the IP address (private IP address) and the 1st port number by the side of a corresponding home network (step S5204), and the IP packet concerned is sent out to a home network 2010 (step S5205). Thus, address translation from a global IP address and the 2nd port number to a private address and the 1st port number is performed.

[0464] In addition, it does not register with the address port number translation table 2207, and the packet is discarded when it is not a packet addressed to AV contact 2201 itself (step S5206).

[0465] The IP packet which return and address port number transform processing (IP masquerade processing) were performed to explanation of drawing 53 , and was sent out to the home network 2010 side reaches the DVD player 2003 (step S5011), and the DVD player 2003 sends the homepage of the DVD player 2003 by making the global IP address of the IP terminal 2102 into a destination address. A private IP address "P. 3" and the transmitting agency port number of the transmitting agency IP address of the IP packet in that case are the 1st port number "80" (step S5012).

[0466] The IP packet containing the homepage of the DVD player 2003 is explained about processing actuation of the AV contact 2201 when receiving from a home network 2010 side, i.e., address port number transform-processing actuation of step S5013 of drawing 53 , with reference to the flow chart shown in drawing 57 .

[0467] The group of the transmitting agency address of the IP packet which received the AV contact 2201, and a port number confirms whether register with the address port number translation table 2207 (step S5301 – step S5302). If registered, after substituting the destination IP address concerned and a destination port number for the IP address (global unique IP address) and the 2nd port number by the side of the corresponding Internet according to the address port number translation table 2207 (step S5303), the IP packet concerned is sent out to the Internet 2101 (step S5304). In addition, in step S5303, when not registering with the address port number translation table 2207, the usual IP masquerade processing is performed (step S5305). That is, the group of a source address and a port number is newly registered into an address port number translation table, and it prepares for subsequent IP masquerade communication links.

[0468] The IP packet which return and address port number transform processing (IP masquerade processing) were performed to explanation of drawing 53 , and was sent out to the Internet 2101 side will reach the IP terminal 2102 (step S5014), the homepage of the DVD player 2003 will be displayed on the IP terminal 2102, and the user of the IP terminal 2102 will operate the DVD player 2003 by remote control using this screen.

[0469] Although this remote operation is performed between the IP terminal 2105 and the DVD player 2003 by exchanging a demand according initiation of playback actuation of for example, the DVD player 2003 etc. to a CGI program, and its processing result by the IP packet, though natural, IP masquerade processing like step S5010 of drawing 53 and step S5013 is performed in that case.

[0470] In the meantime, there is no recognition of 2102 IP terminal that he is communicating with the node (DVD player 2003 which specifically had a private IP address) of private address space. Thus, access to the service from global unique IP address space offered all over private IP address space is enabled by treating introduction and address translation processing (IP masquerade processing) of service as one.

[0471] In addition, in this operation gestalt, although address port number transform processing by the AV contact 2201 between the home networks 2010 which have private IP address space as the Internet 2101 and the 1st network which have global IP address space as the 2nd network has been explained, though natural, all of the following combination are possible for the 1st and 2nd networks.

[0472] (1) This invention is applicable also as the combination of a global IP address, the

combination (2) IPv four address with a private IP address, the combination (3) IPv6 address with the IPv6 address, and the link local IPv6 address, for example, the Internet employed in the IPv four address as the 2nd network, and the Internet employed in the IPv6 address as the 1st network.

[0473] Moreover, this invention can apply the 2nd network as it is also as the Internet employed in the IPv6 address, and the Internet employed in the link local IPv6 address as the 1st network.

[0474] Moreover, in the above-mentioned operation gestalt, as the approach of the advertisement service on a home network 2010 for the Internet 2102, although the approach using the homepage on the AV contact 2201 has been explained How to use LDAP (lightweight directory access protocol) as the approach of this service advertisement in addition to the above-mentioned approach, The approach using the configuration option of DHCP (dynamic host configuration protocol), Various approaches, such as an approach using the remote access of MIB (management information base) of SNMP (simple network-control protocol), can be considered. As the approach of this service advertisement, even if it uses which these approaches, it is easy to be natural.

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[Translation done.]

**\* NOTICES \***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1] Drawing showing the example of 1 configuration of the network system concerning the 1st operation gestalt of this invention

[Drawing 2] Drawing showing the example of an internal configuration of AV contact concerning this operation gestalt

[Drawing 3] Drawing showing an example of the sequence of a terminal / service collection

[Drawing 4] Drawing showing an example of the contents described by Configuration ROM

[Drawing 5] Drawing showing other examples of the contents described by Configuration ROM

[Drawing 6] Drawing showing the example of further others of the contents described by Configuration ROM

[Drawing 7] Drawing showing the example of a screen in the case of performing the display according to service

[Drawing 8] Drawing showing the example of a screen in the case of performing the display according to terminal

[Drawing 9] Drawing showing an example of a procedure which registers service information to a directory agent

[Drawing 10] Drawing showing an example of the information registered into a directory agent

[Drawing 11] Drawing showing the example of a screen in the case of performing the display according to service

[Drawing 12] Drawing showing an example of the procedure which receives service information from a directory agent

[Drawing 13] Drawing showing an example of the information received by the directory agent

[Drawing 14] Drawing showing the example of a screen in the case of performing the display according to service

[Drawing 15] Drawing showing the example of a screen for DVD player actuation

[Drawing 16] Drawing showing an example of the sequence about the command group which flows the network top in the case of using the service on domestic [ 1st / LAN ] from on domestic [ 2nd / LAN ], and a protocol group

[Drawing 17] Drawing for explaining command conversion

[Drawing 18] Drawing showing other examples of the sequence about the command group which flows the network top in the case of using the service on domestic [ 1st / LAN ] from on domestic [ 2nd / LAN ], and a protocol group

[Drawing 19] Drawing showing other examples of the sequence about the command group which flows the network top in the case of controlling the equipment connected to domestic [ 1st / LAN ] from on domestic [ 2nd / LAN ], and a protocol group

[Drawing 20] Drawing for explaining command conversion

[Drawing 21] Drawing showing the example of 1 configuration of PC concerning the 2nd operation



gestalt of this invention

[Drawing 22] Drawing showing an example of the software configuration of the device driver concerning this operation gestalt

[Drawing 23] The flow chart which shows a logical device management object initialization procedure

[Drawing 24] The flow chart which shows a logic device-class object initialization procedure

[Drawing 25] The flow chart which shows a logical device object initialization procedure

[Drawing 26] The flow chart which shows a physical device object initialization procedure

[Drawing 27] Drawing for explaining the software structure at the time of using an unknown type

[Drawing 28] The flow chart which shows the new device-class addition demand procedure by application

[Drawing 29] The flow chart which shows the new device-class addition procedure by the logical device management object

[Drawing 30] Drawing showing the example of the network structure of a system which connected between domestic [ concerning the 3rd operation gestalt of this invention / LAN ]

[Drawing 31] Drawing showing the software structure of the service via a network before connection of a client side

[Drawing 32] Drawing showing the software structure of the service via a network after connection of a client side

[Drawing 33] Drawing showing the software structure of the service via a network before the connection by the side of a proxy

[Drawing 34] Drawing showing the software structure of the service via a network after the connection by the side of a proxy

[Drawing 35] Drawing having shown the example of a configuration of AV contact concerning the 4th operation gestalt of this invention

[Drawing 36] Drawing having shown the example of the homepage which presented the service provision equipment which is held in the 2nd domestic network, and in which all remote control is possible

[Drawing 37] The flow chart for explaining the creation procedure of a homepage as shown in drawing 36

[Drawing 38] The flow chart for explaining the creation procedure of the homepage of service provision equipment

[Drawing 39] Drawing having shown the example of the homepage of service provision equipment (DVD player)

[Drawing 40] The sequence diagram for explaining the processing actuation in the case of carrying out remote control of the service provision equipment held in the 2nd domestic network (when the icon and the RTSP command of a homepage are matched and IP capsulation of the transmit data is carried out further).

[Drawing 41] Drawing having shown one example of the text of the homepage transmitted.

[Drawing 42] Drawing having shown the example of a configuration of the HTTP/RTSP processing facility of AV contact

[Drawing 43] The sequence diagram for explaining the processing actuation in the case of carrying out remote control of the service provision equipment held in the 2nd domestic network (when the icon and the RTSP command of a homepage are matched and IP capsulation of the transmit data is not carried out further).

[Drawing 44] Drawing having shown other examples of the text of the homepage of service provision equipment (DVD player) (when the program which generates the RTSP command is added to the icon of "playback" of drawing 39 )

[Drawing 45] The flow chart which showed the creation procedure of the homepage for a detail setup of service provision equipment

[Drawing 46] Drawing having shown an example of text description of the homepage for a detail setup of service provision equipment (DVD player) (in the \*\*\*\*\* case [ The character string of "slow playback" of drawing 47 a CGI script correspondence the price ])

[Drawing 47] Drawing having shown the example of the homepage for a detail setup of service provision equipment (DVD player)

[Drawing 48] Drawing having shown the example of an internal configuration of AV contact which connects LON

[Drawing 49] Drawing having shown the example of a configuration of HTTP / RTSP processing facility of drawing 48

[Drawing 50] Drawing having shown one example of the table corresponding to a RTSP command

[Drawing 51] Drawing having shown the example of a configuration of the communication system concerning the 5th operation gestalt of this invention.

[Drawing 52] Drawing having shown the example of a configuration of AV contact of drawing 51 .

[Drawing 53] The sequence diagram of the whole communication system shown in drawing 51 in the case of accessing a home network from IP terminal on the Internet, and operating a DVD player by remote control.

[Drawing 54] The flow chart for explaining processing actuation of AV contact based on the information (port number of the service offered by the address and the equipment concerned of a terminal unit on a home network) about the service currently offered on the home network.

[Drawing 55] Drawing having shown the example of the table corresponding to an address port number.

[Drawing 56] The flow chart for explaining processing actuation of AV contact at the time of receiving an IP packet from the Internet side.

[Drawing 57] The flow chart for explaining processing actuation of AV contact at the time of receiving an IP packet from a home network side.

[Drawing 58] Drawing for explaining an IP address and transform processing of a port number concretely using an address port number translation table.

[Drawing 59] Drawing having shown an example of the homepage in \*\* created with AV contact.

[Description of Notations]

1 3 -- IEEE1394 bus

2 -- Public network

4 5 -- AV contact

6 10 -- PC

7 -- Digital TV

8 -- DVD player

9 -- Digital VTR

11 -- Printer

12 -- Home automation network

13 -- Air-conditioner

14 -- Microwave oven

21--1394 interface

22 -- Data link switch

23 -- Public network interface

24 -- IP processing facility

25 -- FANP processing facility

26--1394-/IP service location processing facility

27 -- Service location redundancy

28 -- 1394AV command-processing function

29--1394-/IP command conversion function

61 62 -- Table corresponding to a command

71 -- Service substitute reception function  
72 -- CCCP/LON command conversion function  
73 -- LON command issue function  
81,401,402 -- PC  
82 -- Processor  
83 -- Main memory  
84 -- System bus  
85 -- Secondary storage  
86 87 -- IEEE1394 interface  
88 -- Hard disk  
90,431 -- Printer  
91,432 -- FAX  
92,433 -- Massage equipment  
93,434 -- Toaster  
101, 501, 601 -- Logical device function manager  
102, 502, 602 -- Secondary storage tubing equipment \*\*\*\*\*  
103, 503, 603 -- 1394 interface management functions  
104 604 -- unit1 of a printer  
105 605 -- unit1 of FAX  
106 606 -- unit2 of FAX  
107 607 -- unit1 of massage equipment  
108 608 -- unit2 of massage equipment  
109 508 -- unit1 of a toaster  
111, 112, 511, 512, 611, 612 -- Hard disk function manager  
113, 114, 513, 514, 613, 614 -- Device driver of an IEEE1394 interface  
121, 521, 621 -- 1394 management object  
122, 522, 622 -- Logical device management object  
131-135, 531-534, 631-635 -- Logic device-class object  
131-1,131-2,132-1,133-1,134-1 to 134-3,135-1,533-1,533-2,534-1,631-1,631-2,632-1,633-1,634-1,634-2,635-1,635-2 -- Logical device object  
151-156, 551-153, 651-155 -- Physical device object  
161-166, 561-563, 661-665 -- Driver object  
411 412 -- Network connection equipment  
413 -- ISDN communication line  
421, 422--1394 bus  
504 -- IP function  
571 -- 1394 stub object  
681 -- 1394 proxy object  
1401 -- 1394 I/F  
1402 -- Data link switch  
1403 -- Public network I/F  
1404 -- IP processing facility  
1405 -- FANP processing facility  
1406--1394-/IP service location processing facility  
1407 -- Homepage processing facility  
1408 -- 1394AV command-processing function  
1409 -- HTTP / RTSP processing facility  
1410 -- Table corresponding to RTSP  
2001 -- Personal computer  
2002 -- Printer

2003 -- DVD player  
2010 -- The 1st network (home network)  
2101 -- The 2nd network (Internet)  
2102 -- IP terminal unit  
2201 -- AV contact

---

[Translation done.]

## \* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

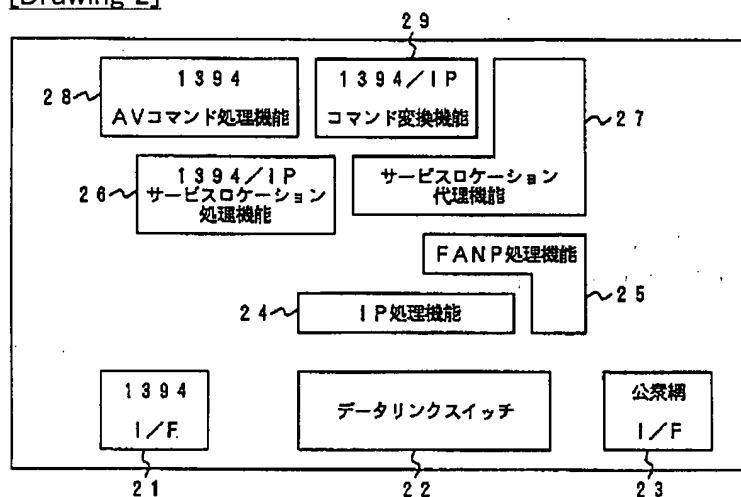
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

## DRAWINGS

[Drawing 2]



[Drawing 3]

第2の AV接続装置 5      DVD プレーヤ 8      デジタル VTR 9      PC 10      プリンタ 11

Config ROMリード →

Config ROMリード →

Config ROMリード →

Config ROMリード →

[Drawing 6]

ノード情報 (ペンダID ノードケーパビリティ等)
ユニット情報 (PC, 又は1394PCIボード)

[Drawing 13]

URL: Service:DVD1394://192. 168. 1. 254:20000  
Attributes: 1394上のDVDの属性情報

URL: Service:DVTR1394://192. 168. 1. 254:20001  
Attributes: 1394上のデジタルVTRの属性情報

URL: Service:http://192. 168. 1. 1:80  
Attributes: WWWサービスの属性情報

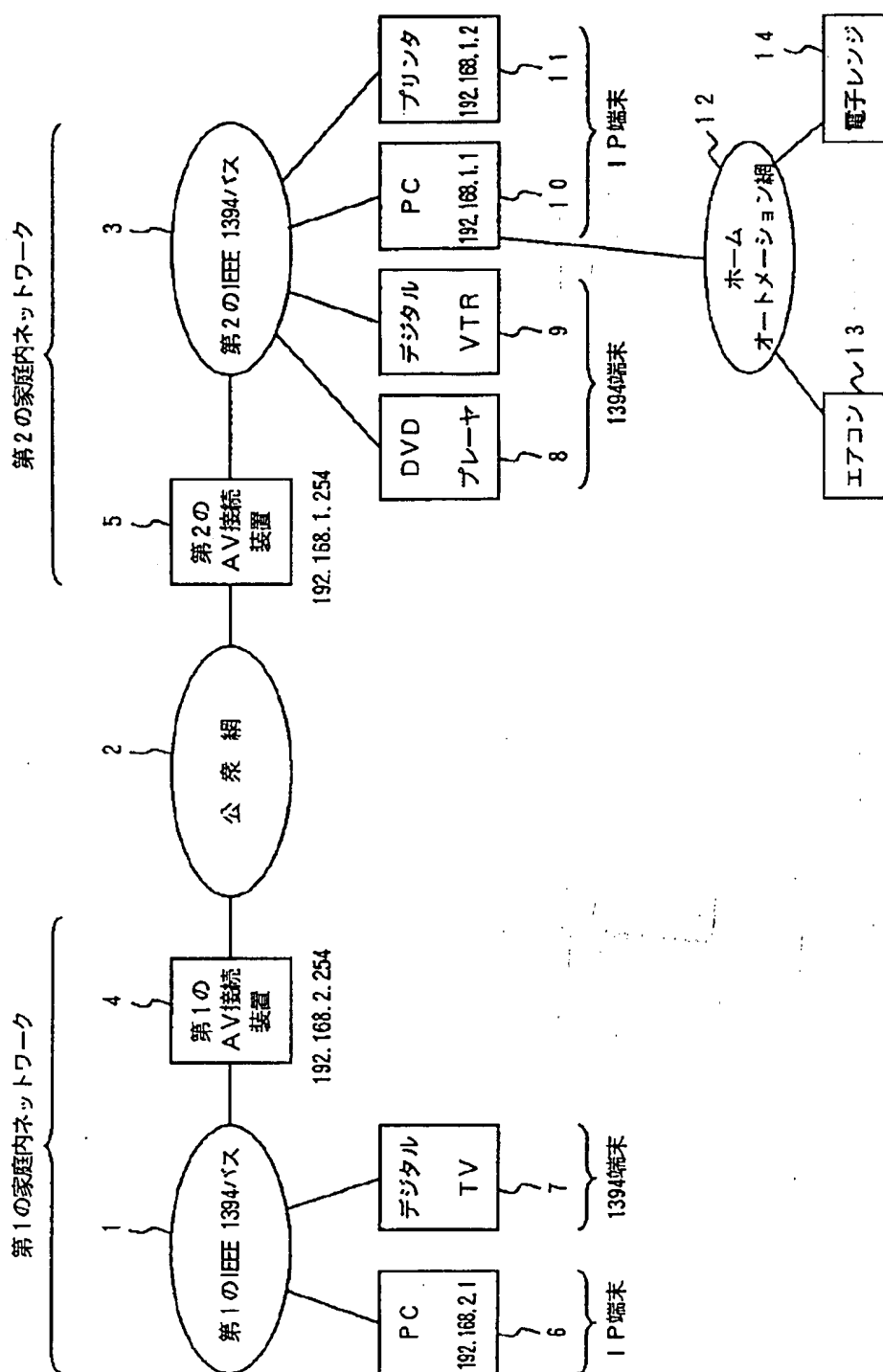
URL: Service:album://192. 168. 1. 1:900  
Attributes: デジタルアルバムサービスの属性情報

URL: Service:aircon-lon://192. 168. 1. 1:15000  
Attributes: LON上のエアコンの属性情報

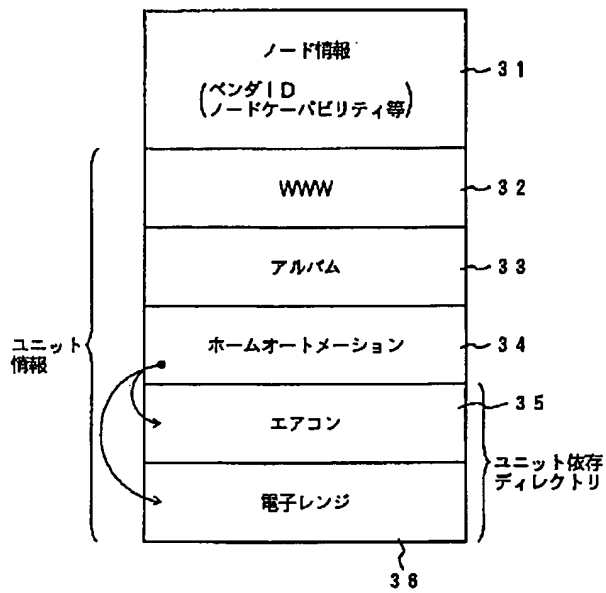
URL: Service:microwave-lon://192. 168. 1. 1:15001  
Attributes: LON上の電子レンジの属性情報

URL: Service:lpr://192. 168. 1. 2:515  
Attributes: lprサービス (プリンタサービス) の属性情報

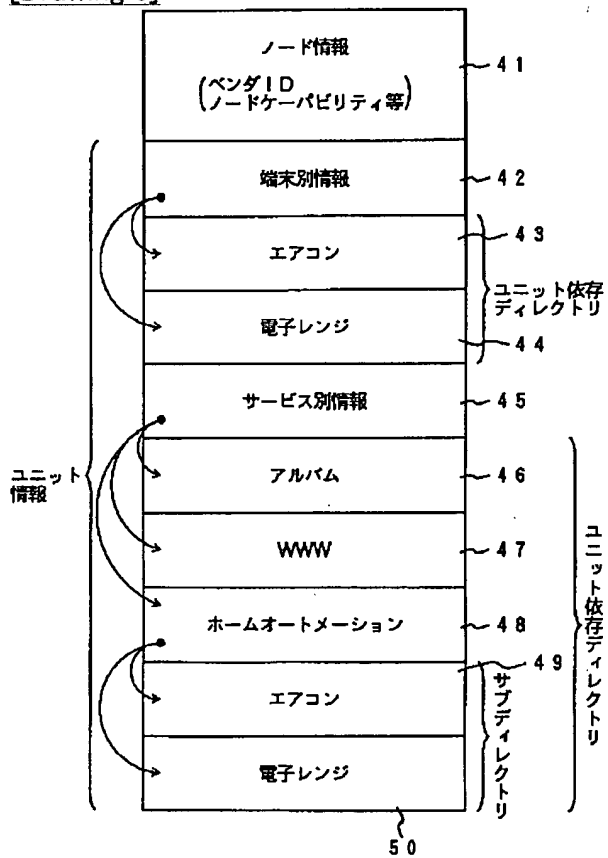
[Drawing 1]



[Drawing 4]

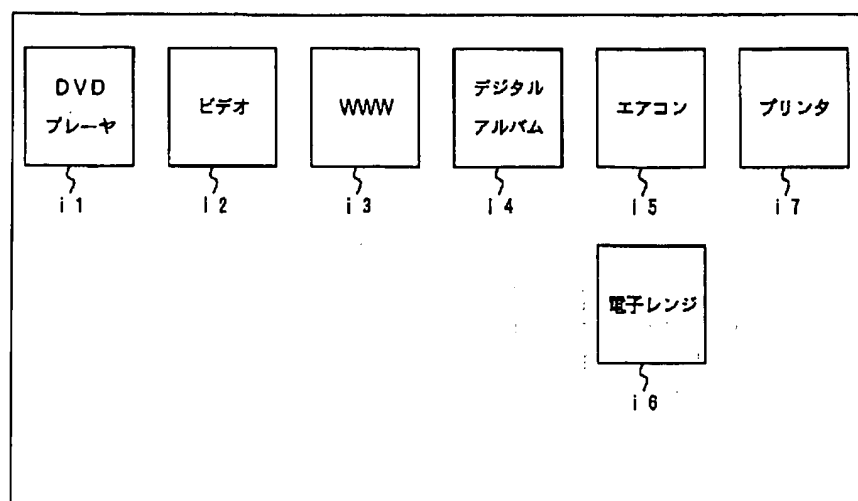


[Drawing 5]

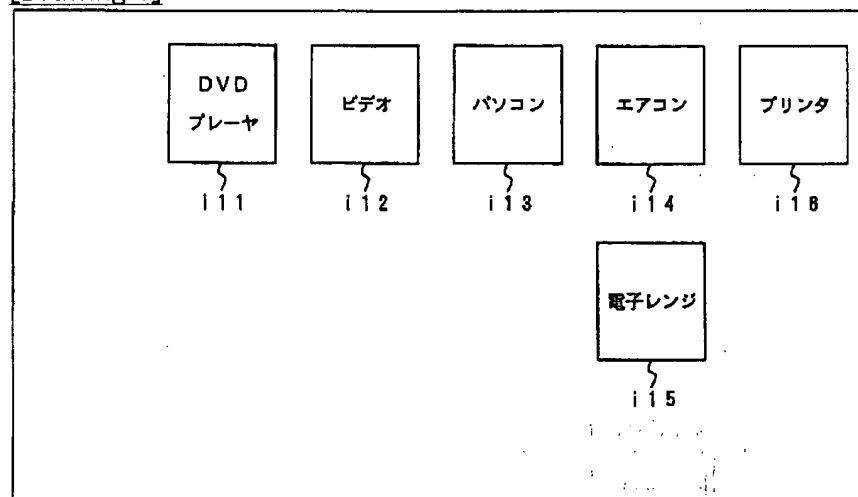


[Drawing 7]

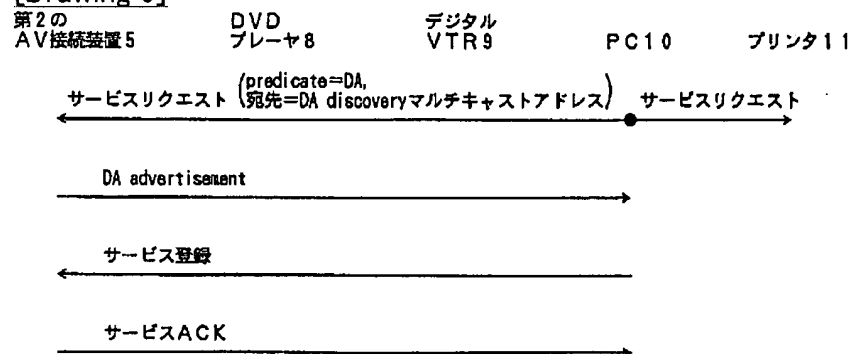




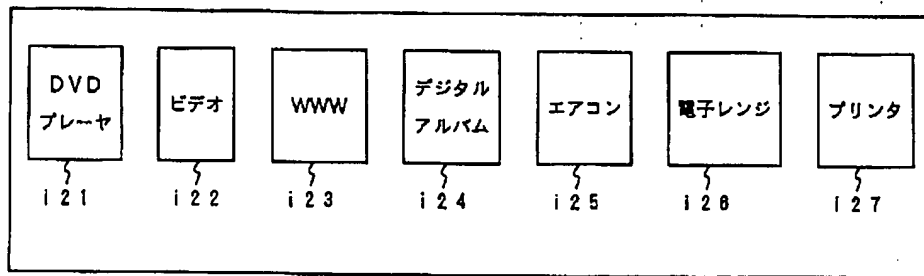
[Drawing 8]



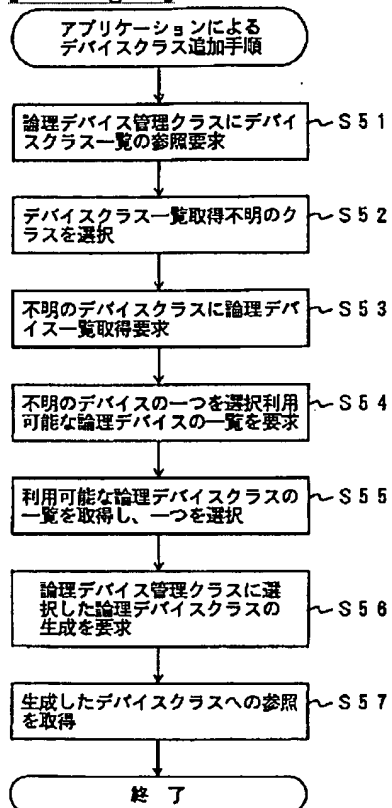
[Drawing 9]



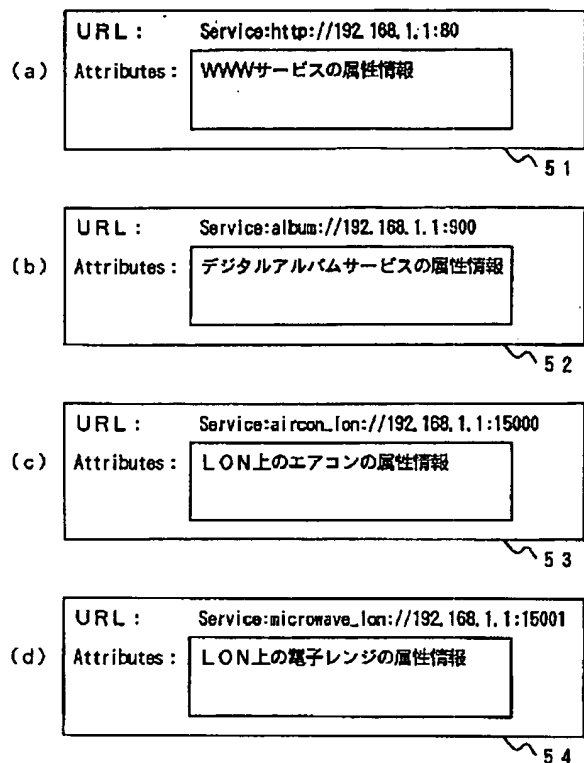
[Drawing 11]



[Drawing 28]



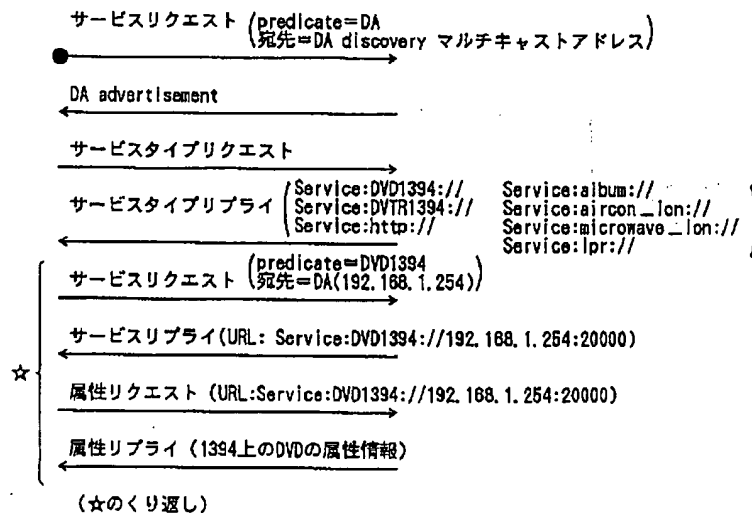
[Drawing 10]



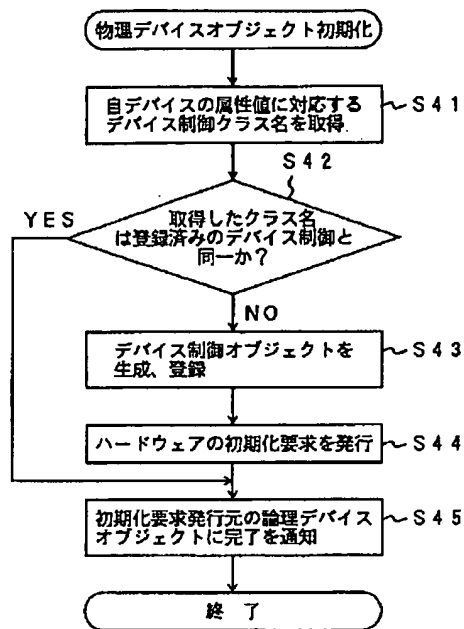
## [Drawing 12]

第1のAV接続装置 4

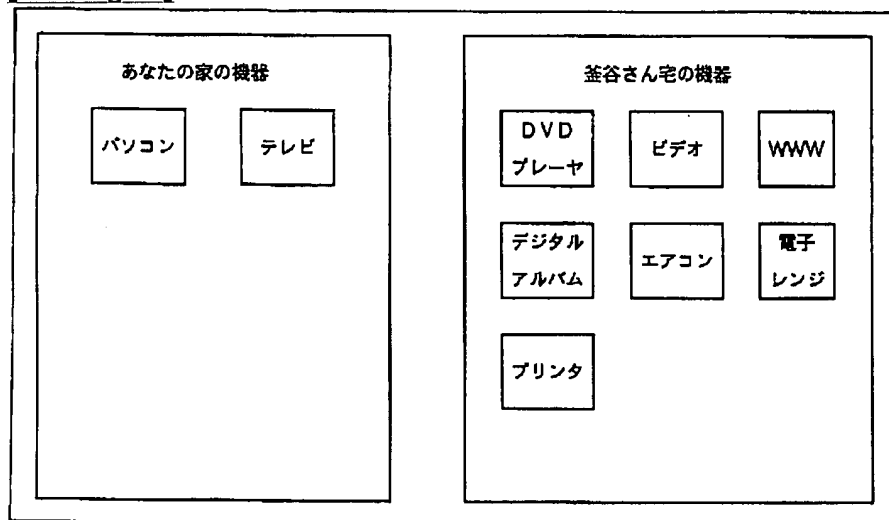
第2のAV接続装置 5



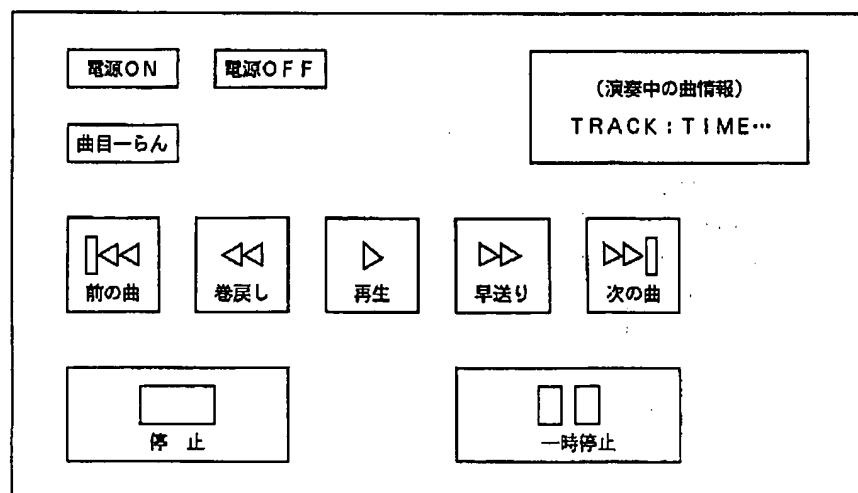
## [Drawing 26]



[Drawing 14]



[Drawing 15]



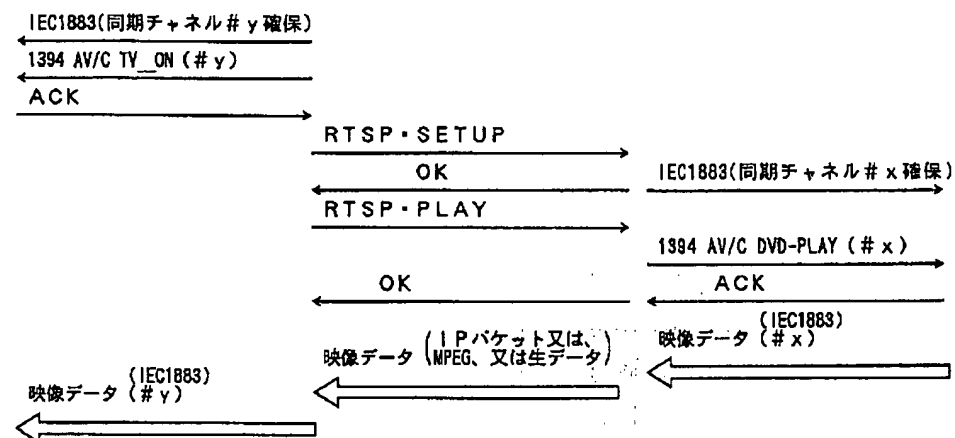
[Drawing 16]

デジタルTV7

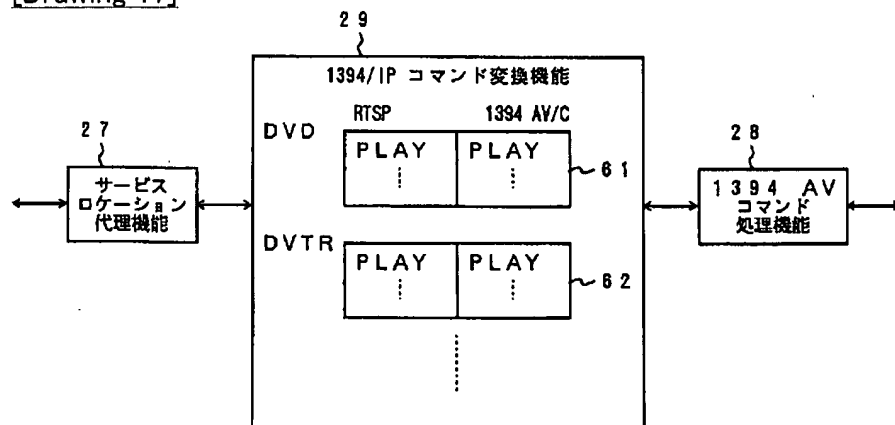
第1のAV接続装置4

第2のAV接続装置5

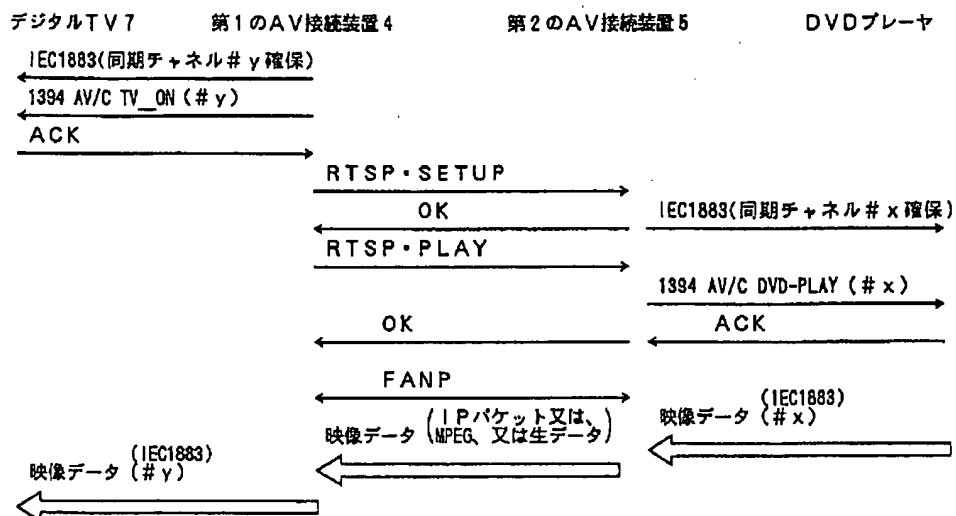
DVDプレーヤ



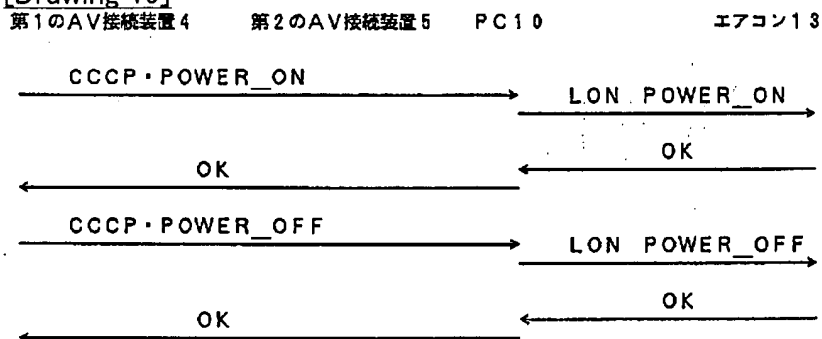
[Drawing 17]



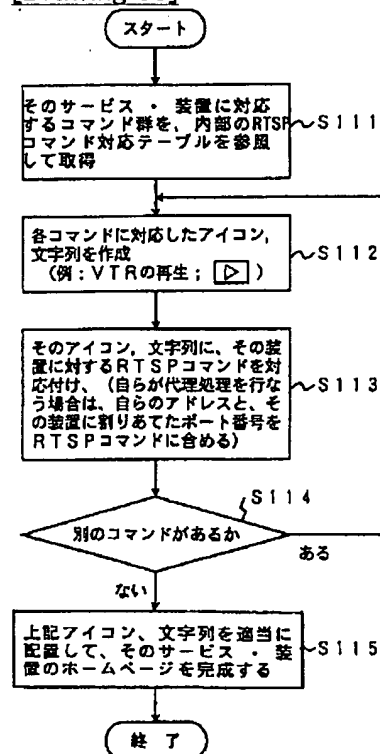
[Drawing 18]



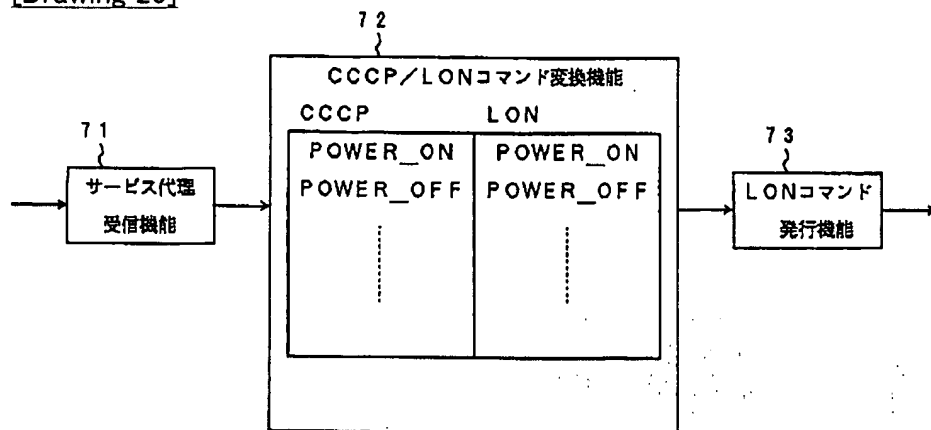
[Drawing 19]



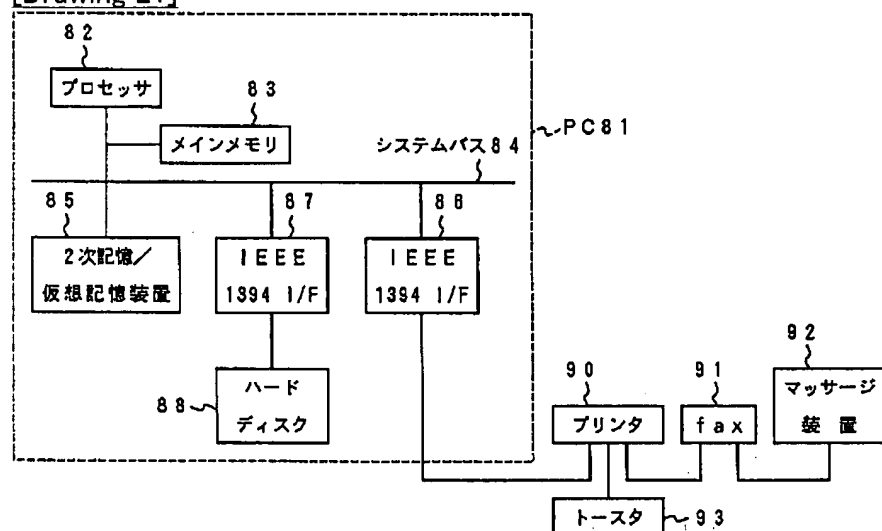
[Drawing 38]



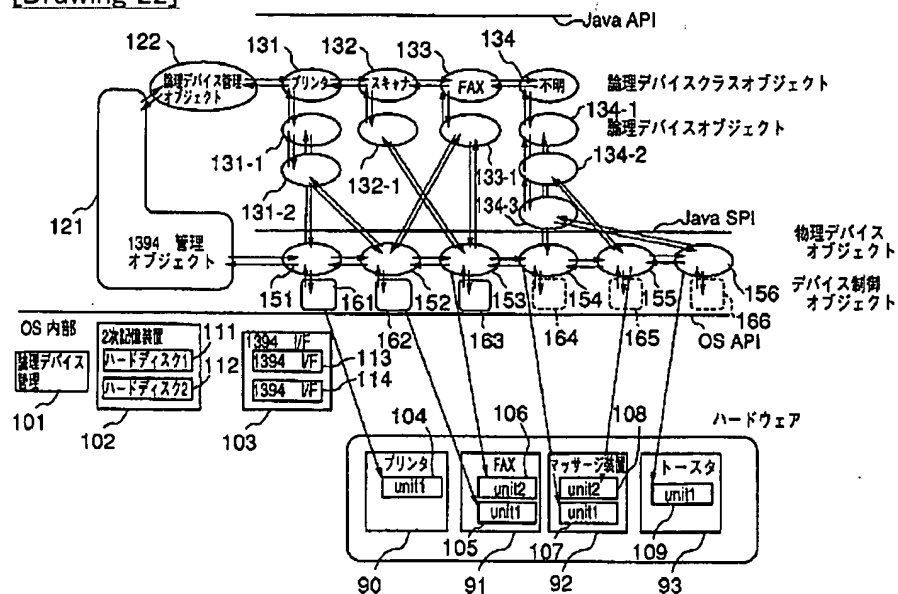
[Drawing 20]



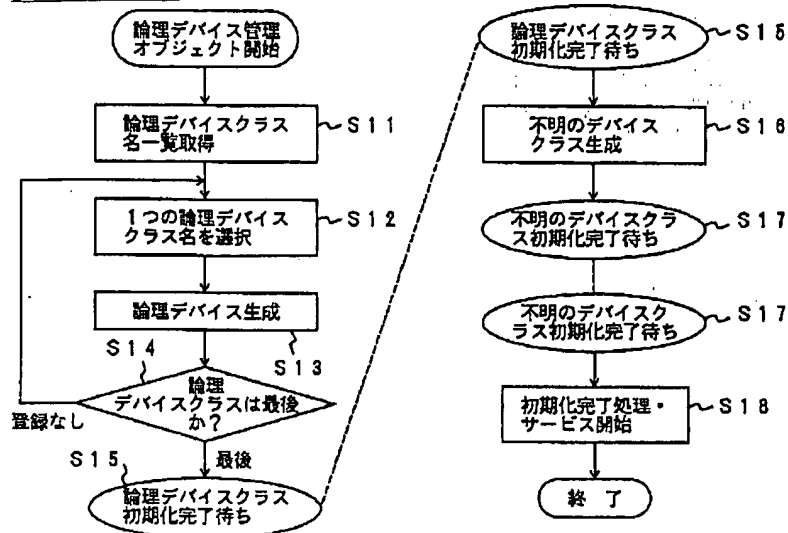
[Drawing 21]



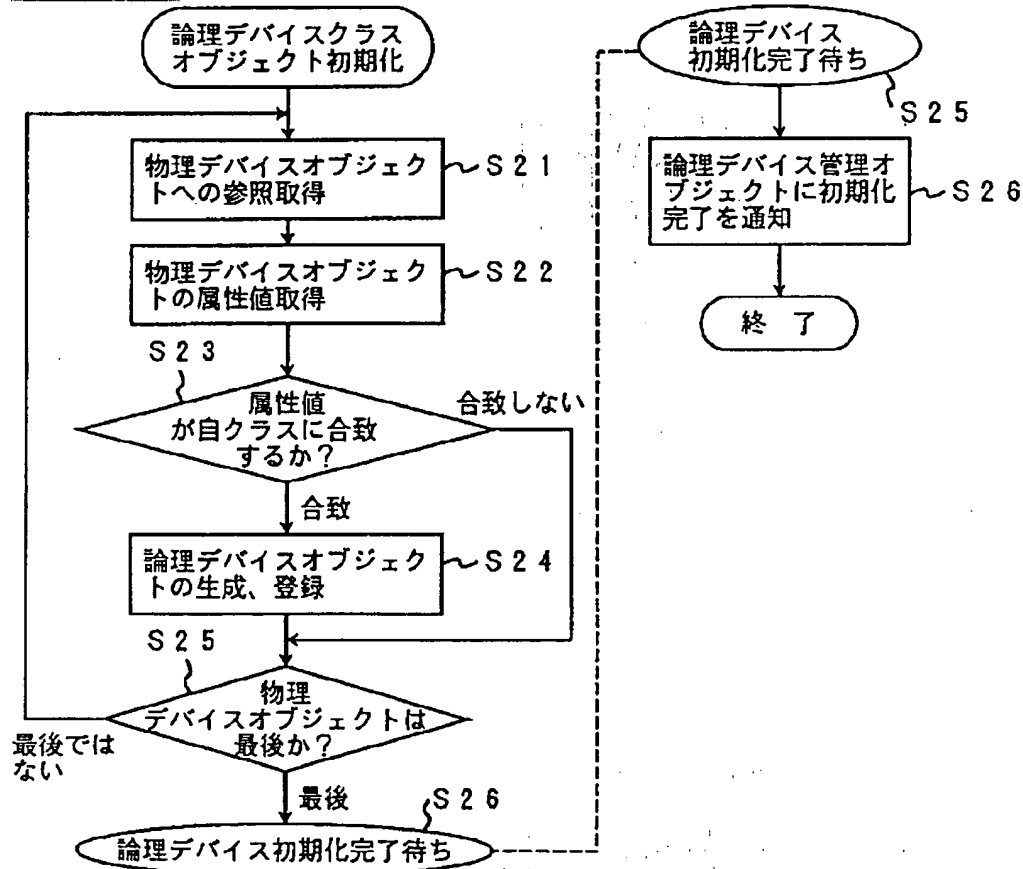
[Drawing 22]



[Drawing 23]

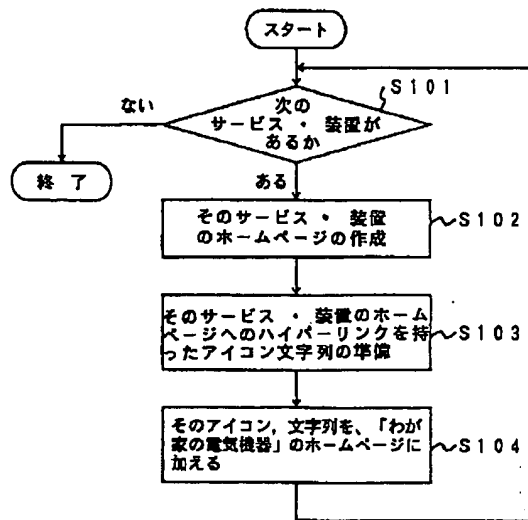


[Drawing 24]

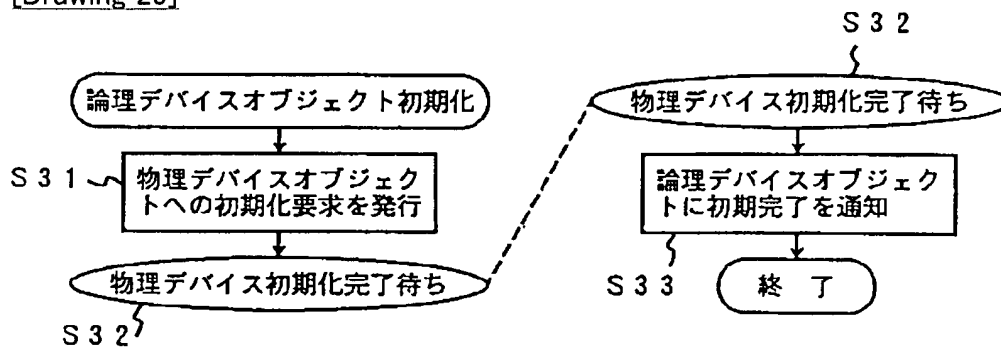


[Drawing 37]

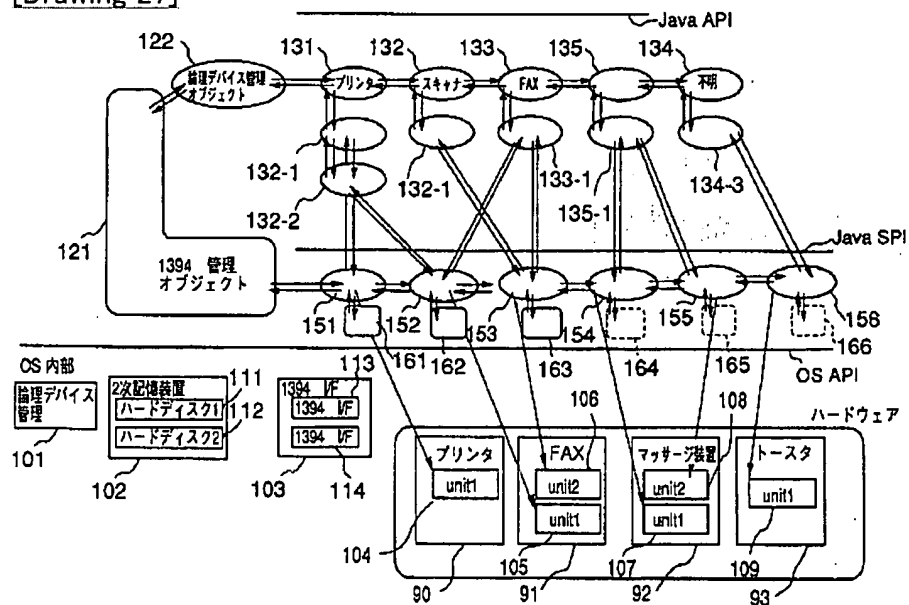




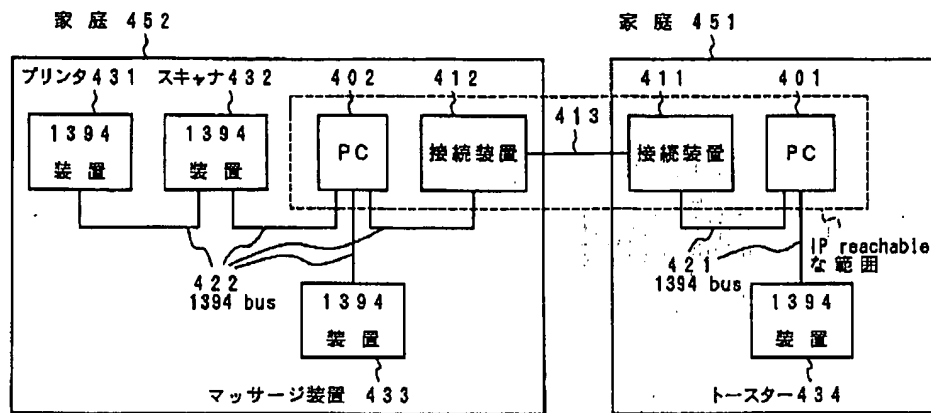
[Drawing 25]



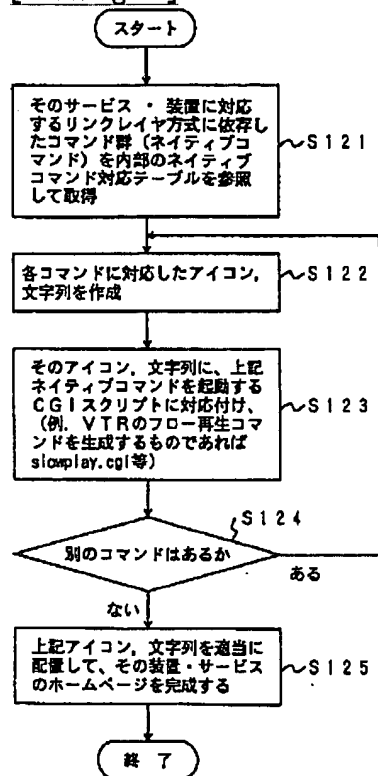
[Drawing 27]



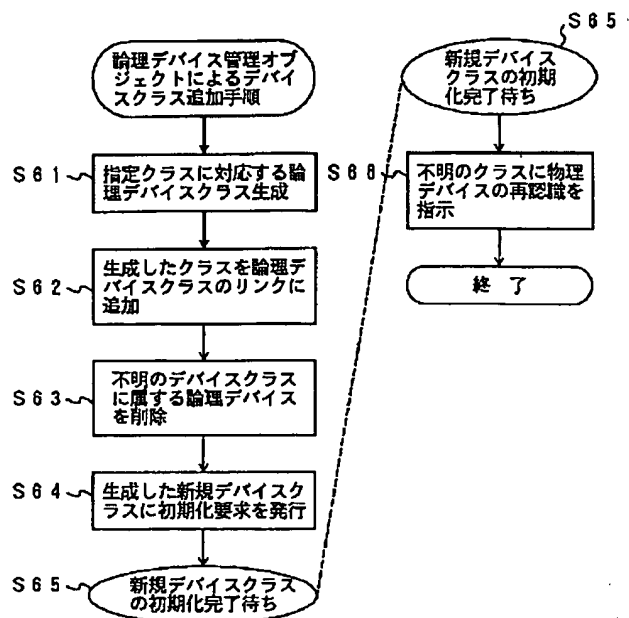
[Drawing 30]



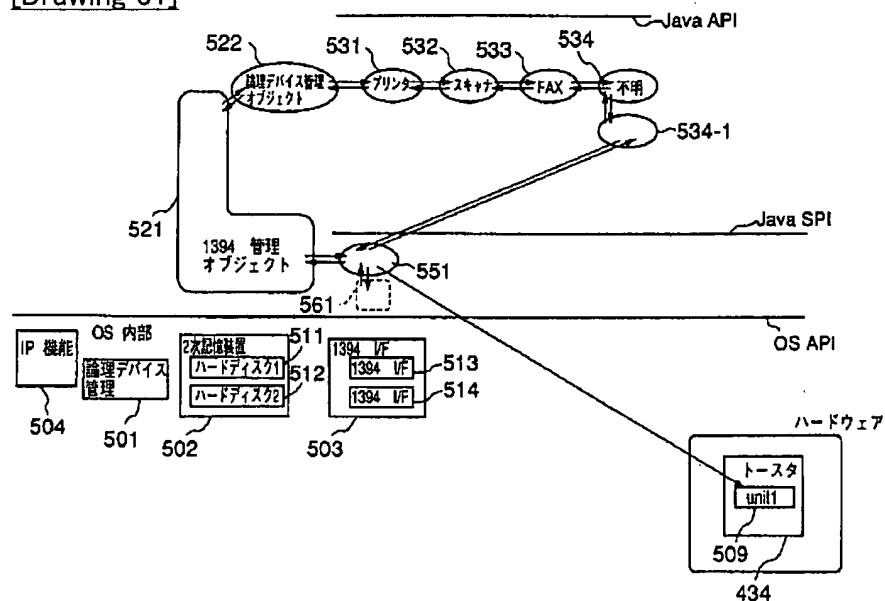
[Drawing 45]



[Drawing 29]



[Drawing 31]

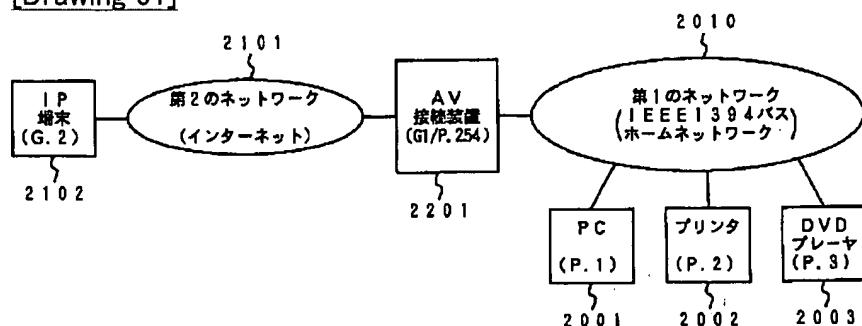


[Drawing 50]

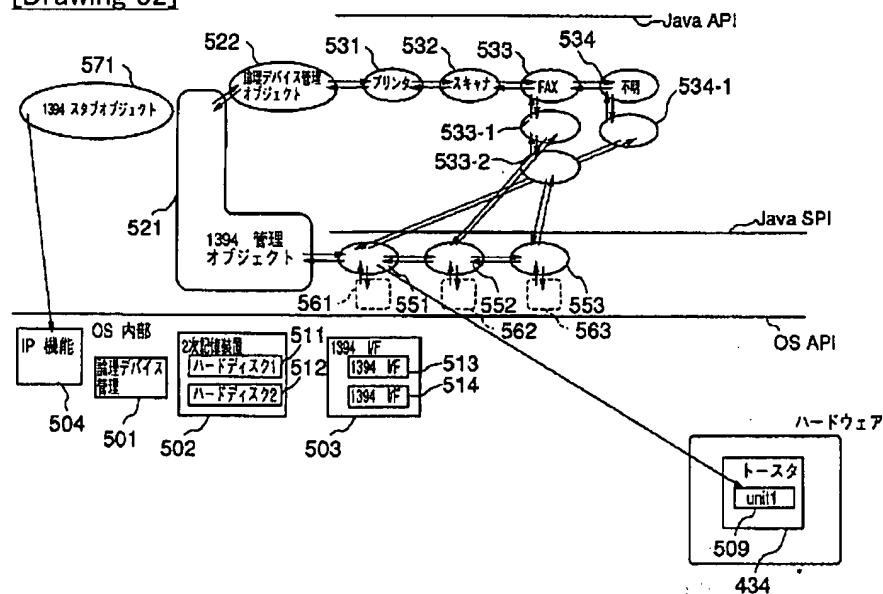
RTSPコマンド対応テーブル

	RTSPコマンド	1394AV/Cコマンド
DVDプレーヤ	PLAY (パラメータ)	PLAY (パラメータ)
	⋮	⋮
デジタルVTR	PLAY (パラメータ)	PLAY (パラメータ)
	⋮	⋮
⋮	⋮	⋮

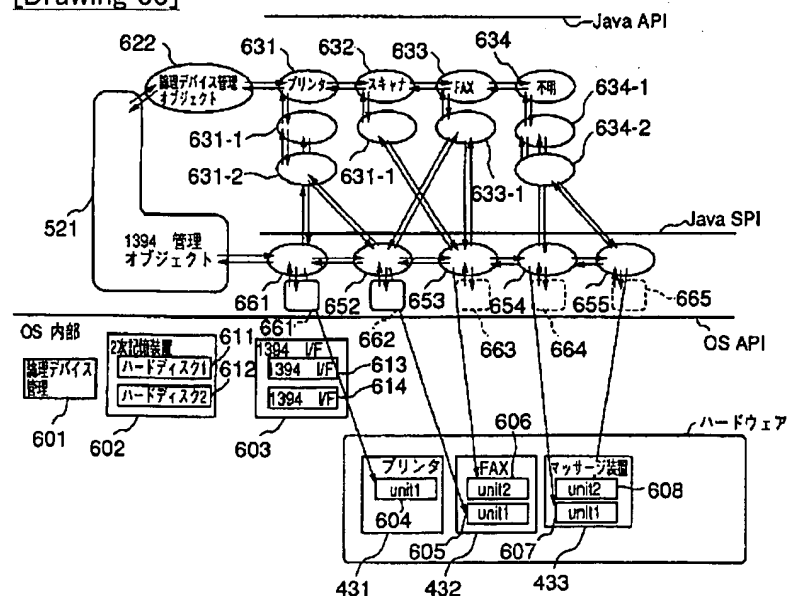
[Drawing 51]



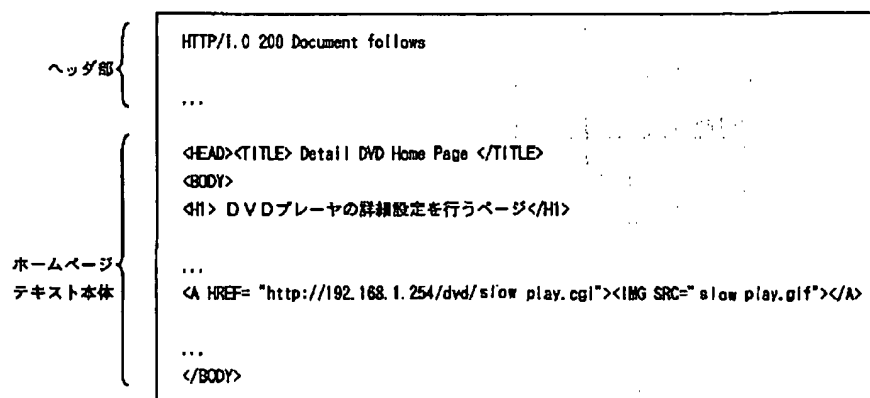
[Drawing 32]



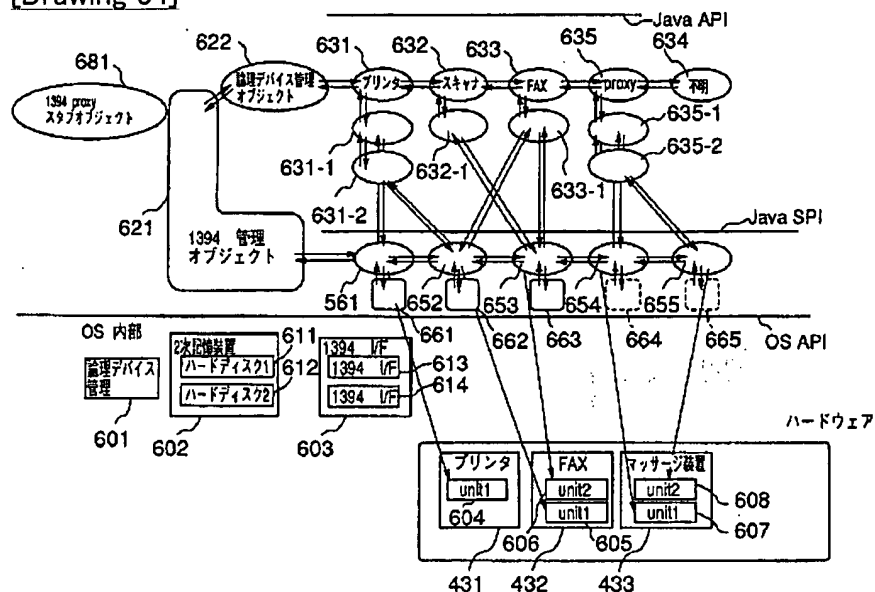
[Drawing 33]



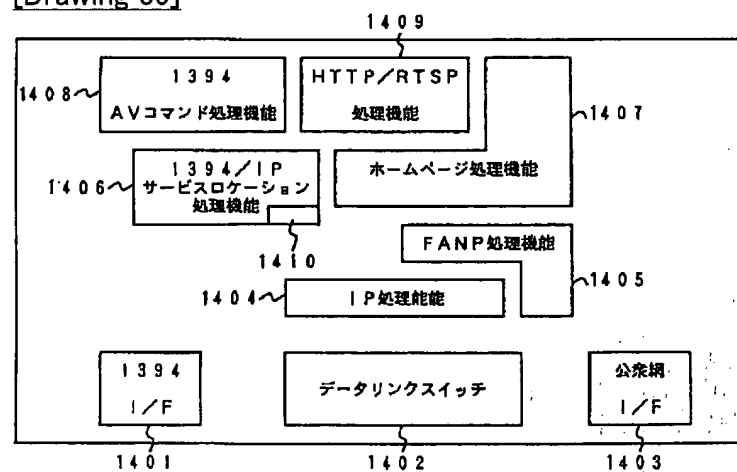
[Drawing 46]



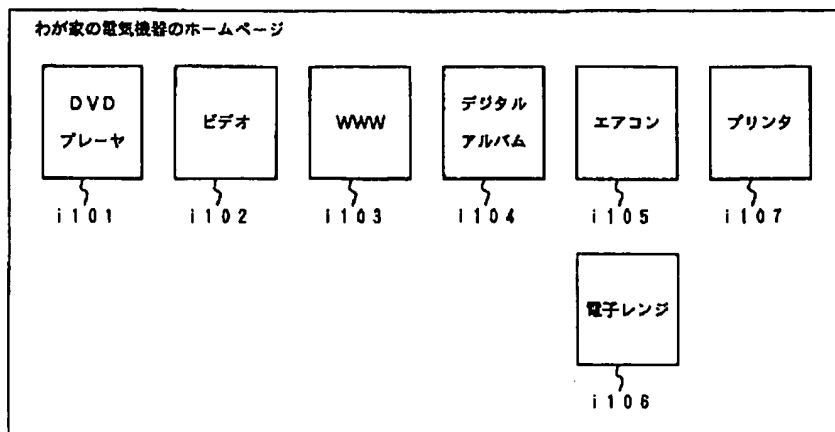
[Drawing 34]



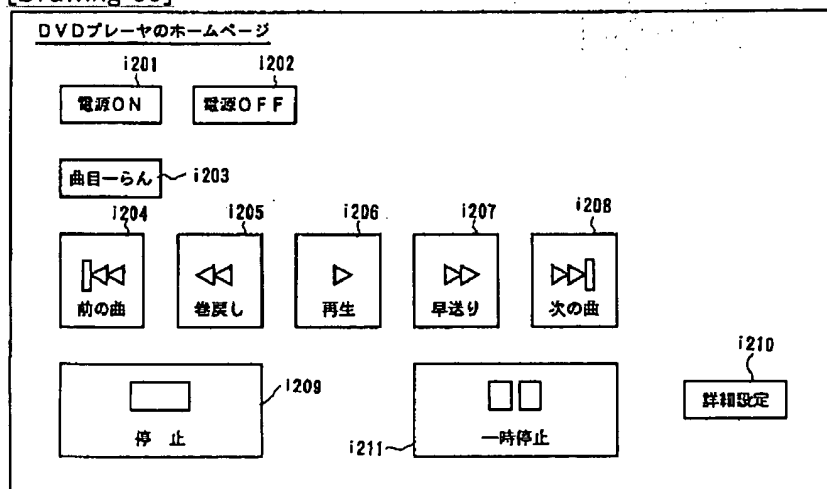
[Drawing 35]



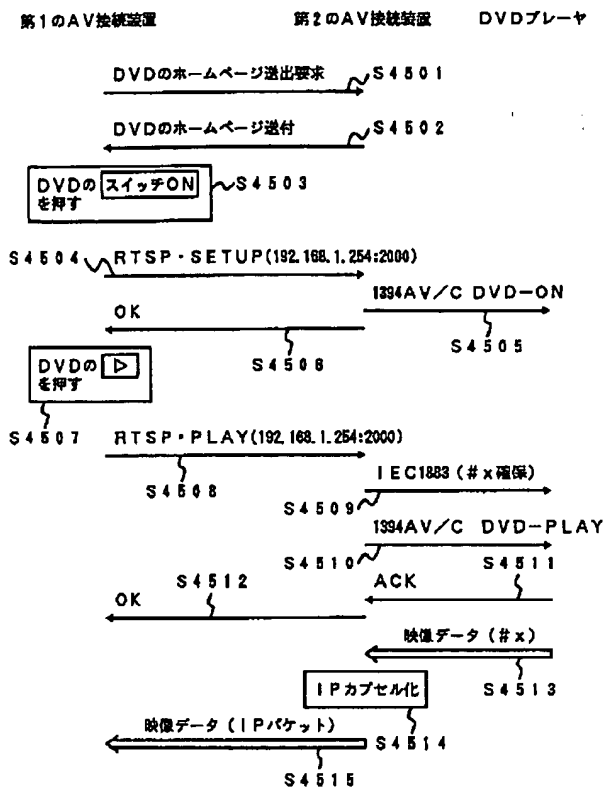
[Drawing 36]



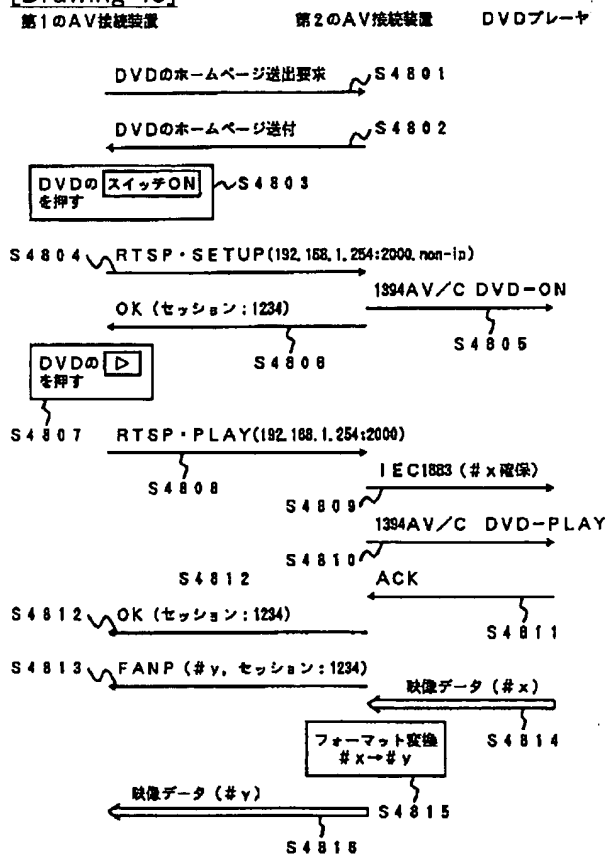
[Drawing 39]



[Drawing 40]



[Drawing 43]

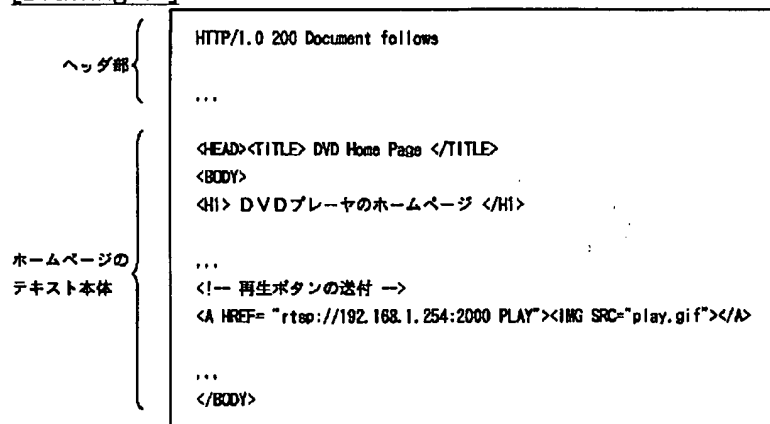


[Drawing 55]

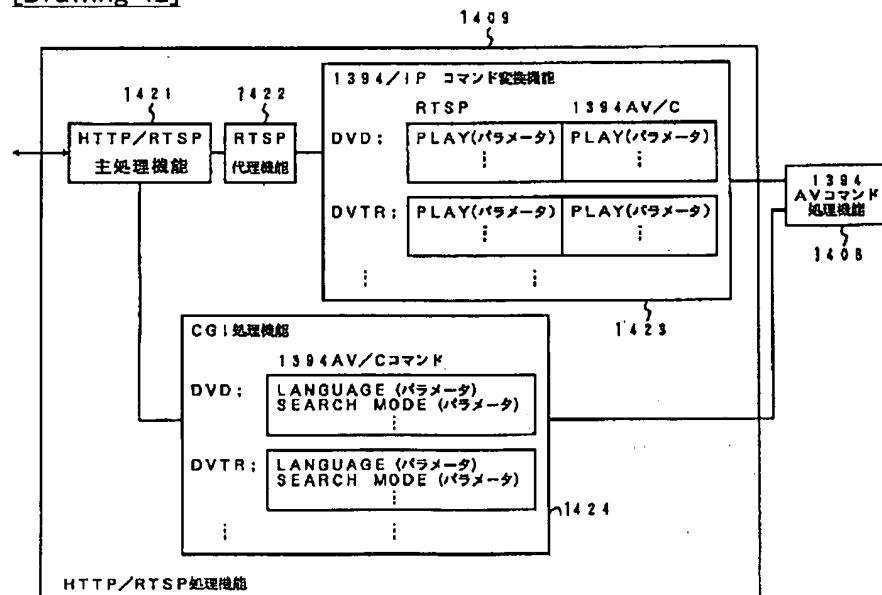
アドレス・ポート番号変換テーブル

インターネット側		ホームネットワーク側	
IPアドレス	第1のポート番号	IPアドレス	第2のポート番号
G.1	2000	G.3	80
G.1	2002	G.2	80
G.1	2004	G.1	80
⋮	⋮	⋮	⋮

[Drawing 41]

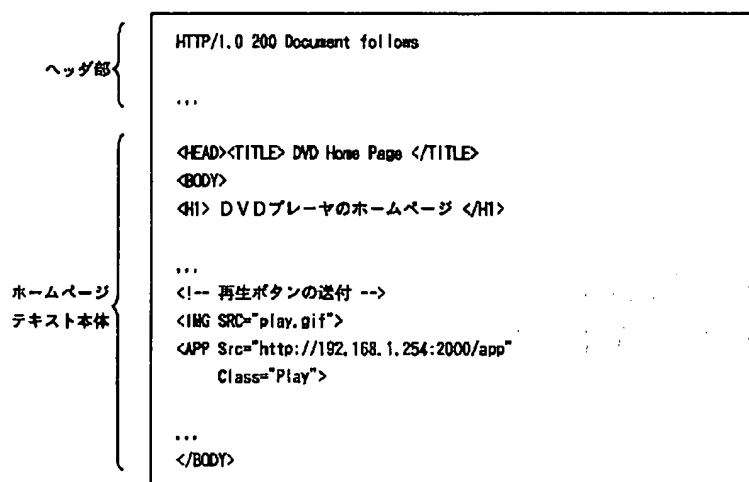


[Drawing 42]

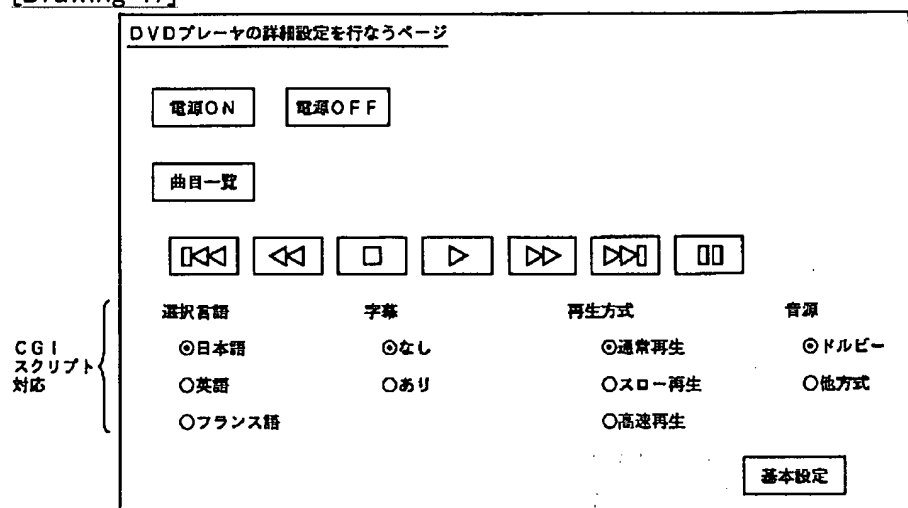


[Drawing 44]

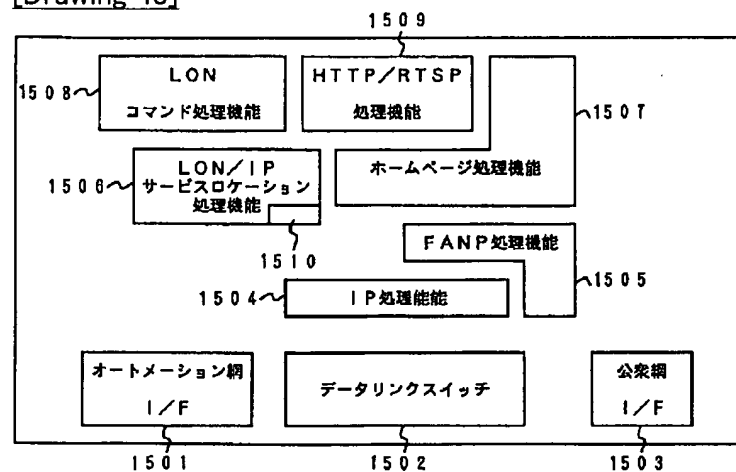




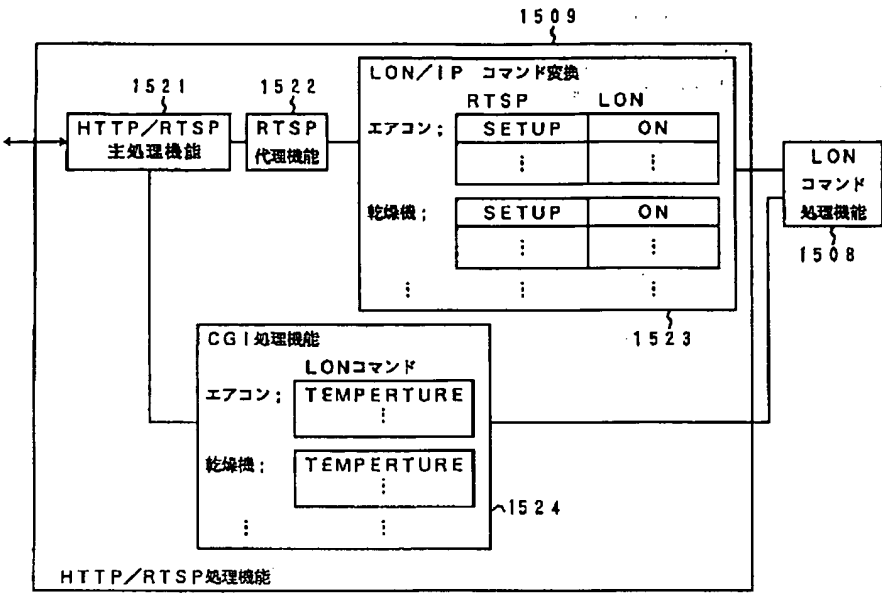
[Drawing 47]



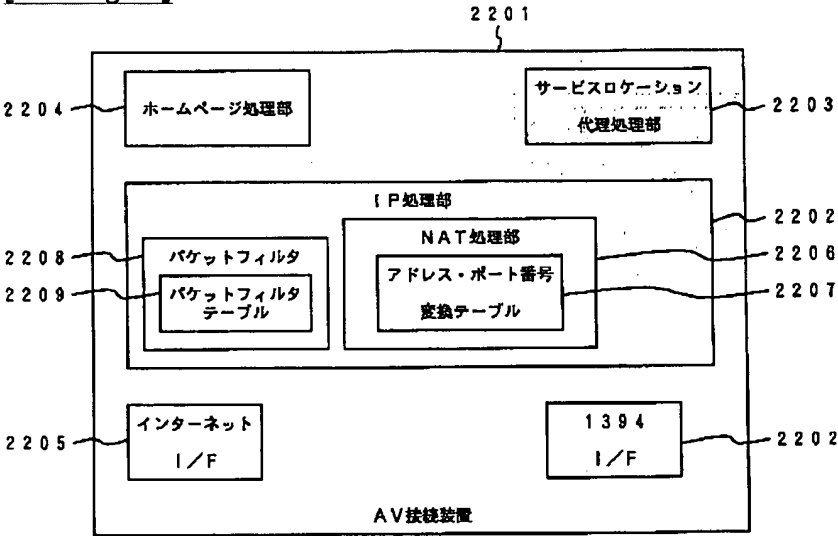
[Drawing 48]



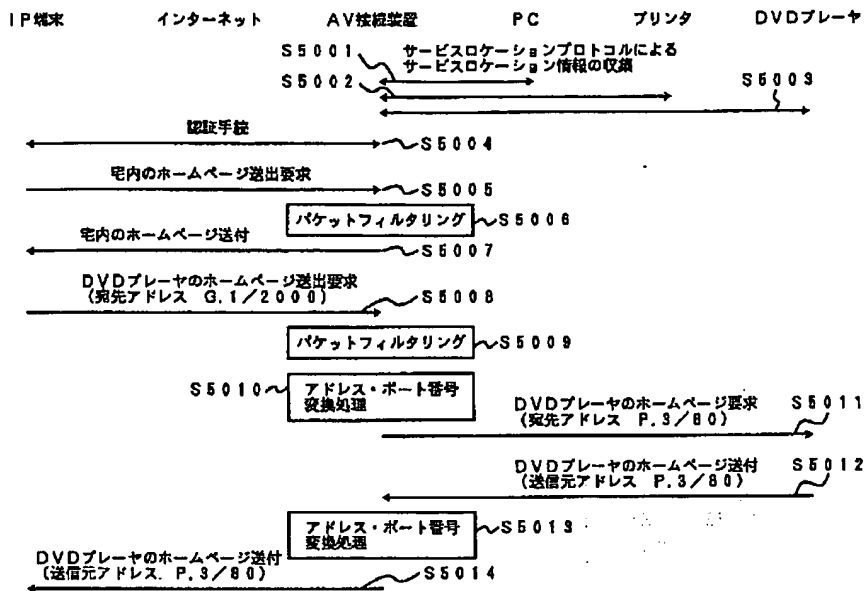
[Drawing 49]



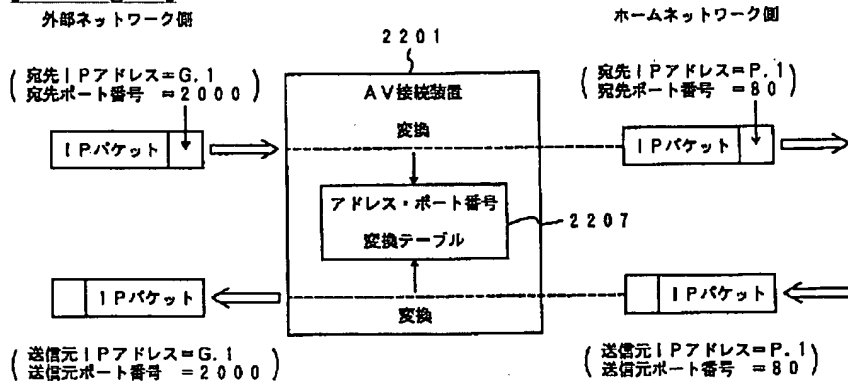
[Drawing 52]



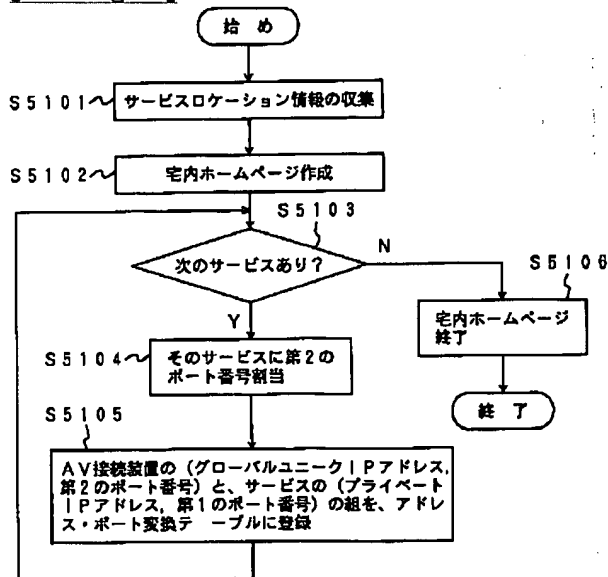
[Drawing 53]



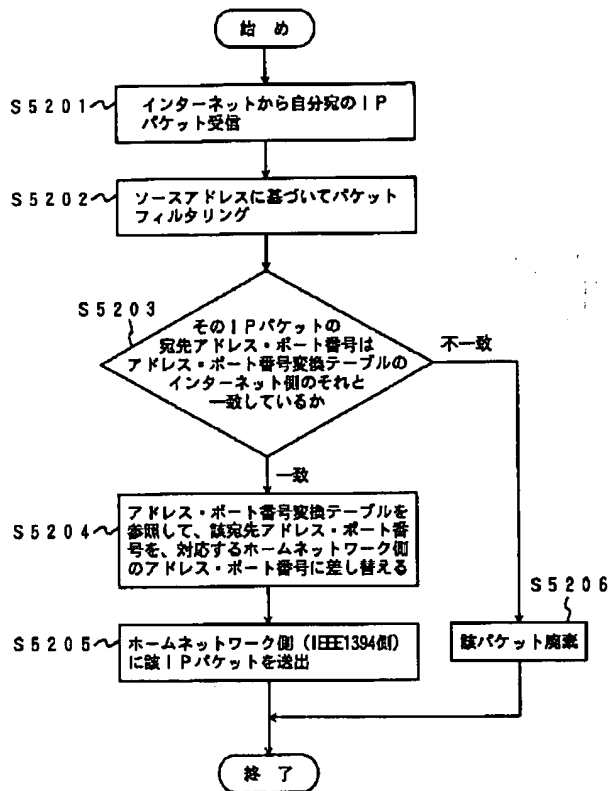
[Drawing 58]



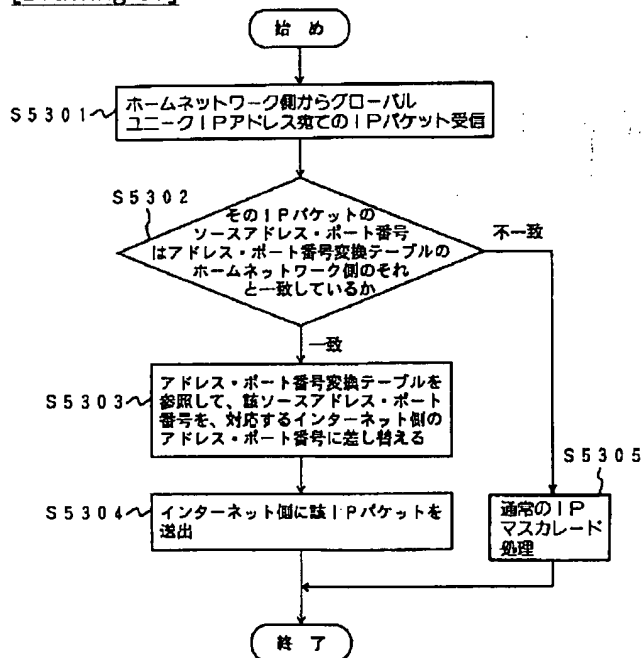
[Drawing 54]



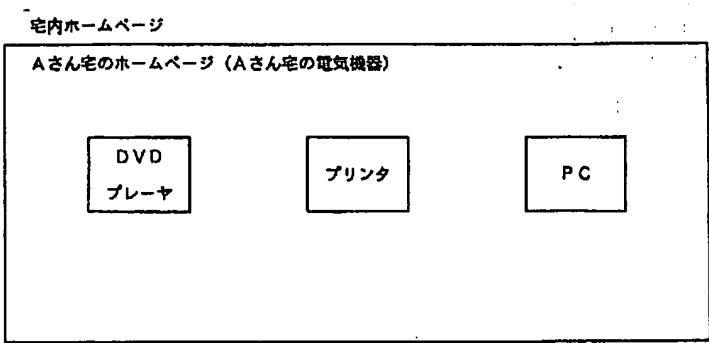
[Drawing 56]



[Drawing 57]



[Drawing 59]



[Translation done.]

(19) 日本国特許庁 (J P)

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(11) 特許出願公開番号

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12/28		G 0 6 F 13/00	3 5 7 A
G 0 6 F 13/00	3 5 7	H 0 4 M 3/00	B
H 0 4 L 12/40		3/42	Z
12/66		H 0 4 L 11/00	3 2 0

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(32) 優先日 平 9 (1997) 10月13日

(33) 優先権主張国 日本 (J P)

(71) 出願人 000003078

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式会社東芝研究開発センター内

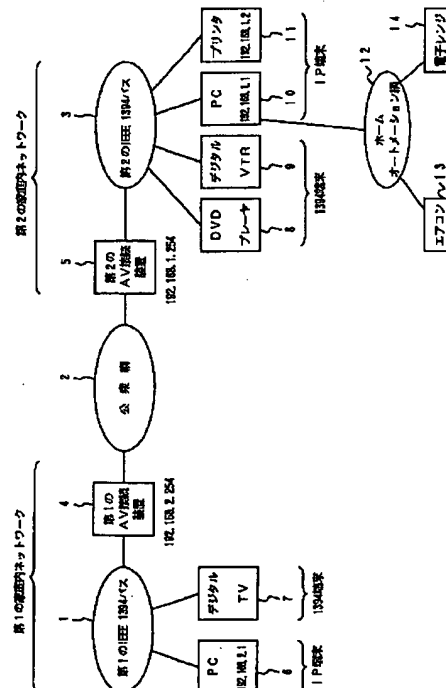
(74) 代理人 弁理士 鈴江 武彦 (外6名)

(54) 【発明の名称】 通信装置、通信制御方法、サービス登録方法、サービス提供方法及び装置制御プログラム登録方法

(57) 【要約】

【課題】 特定のネットワークに依存せず、統一的なサービス提供環境を実現することが可能な通信装置を提供すること。

【解決手段】 第1のネットワークに接続して該第1のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信装置において、前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンド情報に対応する前記第2のネットワークの通信プロトコルに依存する第2のコマンド情報を前記第2のネットワークを介して提供し、この提供された第2のコマンド情報を含むメッセージを前記第2のネットワークを介して受信したとき、該メッセージに含まれる第2のコマンド情報を前記第1のコマンド情報に変換して、前記サービス提供装置を制御することを特徴とする。



## 【特許請求の範囲】

【請求項1】単一アドレス空間にマップされたレジスタの操作を行う通信手段と、

自装置に関する構成情報を記憶する構成情報記憶手段とを備えた通信装置であって、

前記構成情報記憶手段には、自装置上で稼動するサービスに関する情報を動的に記述することを特徴とする通信装置。

【請求項2】単一アドレス空間にマップされたレジスタの操作を行う通信手段と、

自装置に関する構成情報を記憶する構成情報記憶手段とを備えた通信装置であって、

前記構成情報記憶手段には、自装置上で稼動するサービスに関する情報と、自装置の属性に関する情報とを併せて記述することを特徴とする通信装置。

【請求項3】単一アドレス空間にマップされたレジスタの操作を行う第1の通信手段と、

自装置に関する構成情報を記憶する構成情報記憶手段とを備えた通信装置であって、

前記構成情報記憶手段には、自装置に前記第1の通信手段とは異なる第2の通信手段を介して接続されたネットワークに関する構成情報の少なくとも一部を記述することを特徴とする通信装置。

【請求項4】接続されたネットワーク内に存在するディレクトリエージェントにサービスを登録する通信装置であって、

接続された前記ネットワークのデータリンクに依存するプロトコルで通信する、電子的装置のサービスを、該電子的装置に代わって前記ディレクトリエージェントに登録する手段を備えたことを特徴とする通信装置。

【請求項5】接続されたネットワーク内のユーザエージェントからの問い合わせに応じてサービスに関する情報を通知する通信装置であって、

接続された前記ネットワークのデータリンクに依存するプロトコルで通信する、電子的装置のサービスを、該電子的装置に代わって前記ユーザエージェントに通知する手段を備えたことを特徴とする通信装置。

【請求項6】前記ディレクトリエージェントへの登録または前記ユーザエージェントへの通知の際に、登録または通知する前記サービスへのアクセスのためのポートとして、自装置の論理多重識別子を登録または通知することを特徴とする請求項4または5に記載の通信装置。

【請求項7】前記論理多重識別子で指定されたポートにコマンドが到達した場合に、このコマンドを、それに対応する前記データリンクに依存するプロトコルのコマンドに変換して、前記電子的装置に送信することを特徴とする請求項6に記載の通信装置。

【請求項8】前記論理多重識別子のポートに到達したコマンドを、該コマンドに対応する前記データリンクに依存するプロトコルのコマンドにマッピングするための対

応テーブルを有することを特徴とする請求項6に記載の通信装置。

【請求項9】第1の通信手段に従えば通信できず、第2の通信手段に従えば通信可能な電子的装置と、第1の通信手段および第2の通信手段のいずれに従っても通信可能な電子的装置とが接続される可能性のあるネットワークに接続された通信装置におけるサービス登録方法であって、

前記第1の通信手段を通じて前記電子的装置夫々から提供されるサービスに関する情報の登録を受け付け、

前記第2の通信手段により存在が認識された電子的装置で、かつ、前記第1の通信手段を通じての前記通知がなかったものについて、登録すべき該電子的装置夫々により提供されるサービスに関する情報を前記第2の通信手段を用いて取得し、

通知された前記サービスに関する情報および取得された前記サービスに関する情報をもとに、前記ネットワーク上のサービスディレクトリ情報を構成することを特徴とするサービス登録方法。

【請求項10】第1のプロトコルに従えば通信できず、第2のプロトコルに従えば通信可能な少なくとも1つの電子的装置が接続された通信装置におけるサービス提供方法であって、

前記電子的装置により提供されるサービスへのアクセスのためのポートとして前記第1のプロトコルに従う自装置の論理多重識別子を割り当て、

前記論理多重識別子で指定されたポートにコマンドが到達した場合に、このコマンドを、前記第2のプロトコルに従うコマンドに変換して、前記電子的装置に送信することを特徴とするサービス提供方法。

【請求項11】単一アドレス空間にマップされたレジスタの操作を行う通信手段と、

前記通信手段によって認識された電子的装置の属性情報を入手する入手手段と、

前記通信手段に対して前記単一アドレス空間上のレジスタの操作を行う指示を発行することによって前記電子的装置を制御する装置制御プログラムの登録を、入手された前記電子的装置の属性情報に基づいて動作中に行う登録手段とを備えたことを特徴とする通信装置。

【請求項12】前記登録手段は、前記入手手段により入手された前記電子的装置の属性情報に基づいて入手すべき装置制御プログラムの識別名を求める手段と、

求められた前記識別名に基づいて、該当する装置制御プログラムを入手する手段とを有することを特徴とする請求項11に記載の通信装置。

【請求項13】前記電子的装置の属性情報は、前記電子的装置内の予め定められた構成情報記憶領域に記述されたものであり、

前記入手手段は、前記構成情報記憶領域に記述された内

容を読み取ることで前記属性情報を入手することを特徴とする請求項 11 または 12 に記載の通信装置。

【請求項 14】前記単一アドレス空間は、IEEE 1394 バスの形で提供されることを特徴とする請求項 11 ないし 13 のいずれか 1 項に記載の通信装置。

【請求項 15】前記装置制御プログラムの識別名として、外部ネットワークの特定の資源を指示可能な識別名を用いることを特徴とする請求項 12 ないし 14 のいずれか 1 項に記載の通信装置。

【請求項 16】単一アドレス空間にマップされたレジスタの操作を行う手段により所定の電子的装置と通信可能な他の通信装置との間での通信が、論理ネットワークを利用した通信手段によって可能である通信装置であって、

前記通信手段を通じて前記他の通信装置に対して前記電子的装置の属性情報の取得を要求する手段と、  
前記電子的装置を制御する装置制御プログラムの登録を、前記要求により前記他の通信装置から入手した前記電子的装置の属性情報に基づいて動作中に行う手段と、  
前記他の通信装置との間で前記通信手段を通じて前記単一アドレス空間上のレジスタの操作を行う指示に関する情報を送受信する手段とを備えたことを特徴とする通信装置。

【請求項 17】通信装置の動作中に装置制御プログラムを登録する装置制御プログラム登録方法であって、単一アドレス空間にマップされたレジスタの操作を行う所定の通信手段によって認識された電子的装置の属性情報を入手し、  
前記通信手段に対して前記単一アドレス空間上のレジスタの操作を行う指示を発行することによって前記電子的装置を制御する装置制御プログラムの登録を、入手された前記電子的装置の属性情報に基づいて動作中に行うことを特徴とする装置制御プログラム登録方法。

【請求項 18】第 1 のネットワークに接続して該第 1 のネットワークに依存するプロトコルで通信するサービス提供装置を第 2 のネットワークを介して制御するための通信装置において、  
前記サービス提供装置を制御するための前記第 1 のネットワークの通信プロトコルに依存する第 1 のコマンドに対応する前記第 2 のネットワークの通信プロトコルに依存する第 2 のコマンドに関する情報を少なくとも前記第 2 のネットワークを介して提供する提供手段と、  
この提供手段で提供された第 2 のコマンドを含むメッセージを前記第 2 のネットワークを介して受信する受信手段と、  
この受信手段で受信されたメッセージに含まれる第 2 のコマンドを前記第 1 のコマンドに変換し、該第 1 のコマンドで前記サービス提供装置を制御する制御手段と、  
を具備したことを特徴とする通信装置。

【請求項 19】第 1 のネットワークに接続して該第 1

のネットワークに依存するプロトコルで通信するサービス提供装置を第 2 のネットワークを介して制御するための通信装置において、

前記サービス提供装置の提供するサービスに関する情報を収集する収集手段と、

この収集手段で収集されたサービスに関する情報に対応する前記サービス提供装置を制御するための前記第 1 のネットワークの通信プロトコルに依存する第 1 のコマンドに対応する前記第 2 のネットワークの通信プロトコルに依存する第 2 のコマンドに関する情報を少なくとも前記第 2 のネットワークを介して提供する提供手段と、  
この提供手段で提供された第 2 のコマンドを含むメッセージを前記第 2 のネットワークを介して受信する受信手段と、

この受信手段で受信されたメッセージに含まれる第 2 のコマンドを前記第 1 のコマンドに変換し、該第 1 のコマンドで前記サービス提供装置を制御する制御手段と、  
を具備したことを特徴とする通信装置。

【請求項 20】前記サービス提供装置の提供するサービス毎に予め定められた前記第 1 のコマンドに対応する前記第 2 のコマンドを登録したテーブルを具備し、前記収集手段で収集されたサービスに関する情報に対応する第 2 のコマンドに関する情報を該テーブルから取得することを特徴とする請求項 19 記載の通信装置。

【請求項 21】前記第 1 のコマンドと前記第 2 のコマンドとの対応テーブルを具備し、この対応テーブルを参照して前記受信手段で受信された第 2 のコマンドを前記第 1 のコマンドに変換することを特徴とする請求項 18 または 19 記載の通信装置。

【請求項 22】第 1 のネットワークに接続して該第 1 のネットワークに依存するプロトコルで通信するサービス提供装置を第 2 のネットワークを介して制御するための通信装置において、

前記サービス提供装置を制御するための前記第 1 のネットワークの通信プロトコルに依存する第 1 のコマンドを発行するためのホームページを前記第 2 のネットワークを介して提供する提供手段と、

この提供手段で提供された前記ホームページに基づくメッセージを前記第 2 のネットワークを介して受信する受信手段と、

この受信手段で受信されたメッセージに基づき発行された前記第 1 のコマンドで前記サービス提供装置を制御する制御手段と、  
を具備したことを特徴とする通信装置。

【請求項 23】第 1 のネットワークに接続して該第 1 のネットワークに依存するプロトコルで通信するサービス提供装置を第 2 のネットワークを介して制御するための通信装置において、  
前記サービス提供装置の提供するサービスに関する情報を収集する収集手段と、



この収集手段で収集されたサービスに関する情報に対応する前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンドを発行するためのホームページを前記第2のネットワークを介して提供する提供手段と、

この提供手段で提供された前記ホームページに基づくメッセージを前記第2のネットワークを介して受信する受信手段と、

この受信手段で受信されたメッセージに基づき発行された前記第1のコマンドで前記サービス提供装置を制御する制御手段と、

を具備したことを特徴とする通信装置。

【請求項24】 第1のネットワークに接続して該第1のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信装置において、

前記サービス提供装置の提供するサービスに関する情報を収集する収集手段と、

この収集手段で収集されたサービスに関する情報に基づき前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンドを発行するためのホームページを作成する作成手段と、

この作成手段で作成されたホームページを前記第2のネットワークを介して提供する提供手段と、

この提供手段で提供された前記ホームページに基づくメッセージを前記第2のネットワークを介して受信する受信手段と、

この受信手段で受信されたメッセージに基づき発行された前記第1のコマンドで前記サービス提供装置を制御する制御手段と、

を具備したことを特徴とする通信装置。

【請求項25】 前記サービス提供装置の提供するサービス毎に予め定められた前記第1のコマンドに対応する該サービス提供装置を制御するための前記第2のネットワークの通信プロトコルに依存する第2のコマンドを登録したテーブルを具備し、前記収集手段で収集されたサービスに関する情報に対応する第2のコマンドに関する情報を該テーブルから取得して前記ホームページを作成することを特徴とする請求項23または24に記載の通信装置。

【請求項26】 前記メッセージは、前記サービス提供装置を制御するための前記第2のネットワークの通信プロトコルに依存する第2のコマンドを含み、前記制御手段は、前記第1のコマンドと前記第2のコマンドとの対応テーブルを参照して前記受信手段で受信されたメッセージに含まれる第2のコマンドを前記第1のコマンドに変換することを特徴とする請求項22～24のいずれか1つに記載の通信装置。

【請求項27】 前記メッセージは、前記サービス提供装置を制御するための前記第2のネットワークの通信プ

ロトコルに依存する第2のコマンドと、前記第2のネットワークの通信プロトコルに依存するアドレスと、前記第1のネットワークに依存する前記サービス提供装置を特定するための多重識別子とを含み、前記制御手段は、前記第1のコマンドと前記第2のコマンドとの対応テーブルを参照して前記受信手段で受信されたメッセージに含まれる第2のコマンドを前記第1のコマンドに変換し、該第1のコマンドで前記多重識別子にて識別されるサービス提供装置を制御することを特徴とする請求項22～24のいずれか1つに記載の通信装置。

【請求項28】 前記ホームページは、前記サービス提供装置を制御するための前記第2のネットワークの通信プロトコルに依存する第2のコマンドを含むメッセージを生成するためのプログラムを含み、前記制御手段は、前記第1のコマンドと前記第2のコマンドとの対応テーブルを参照して前記受信手段で受信されたメッセージに含まれる第2のコマンドを前記第1のコマンドに変換し、該第1のコマンドでサービス提供装置を制御することを特徴とする請求項22～24のいずれか1つに記載の通信装置。

【請求項29】 前記制御手段は、前記受信手段で受信されたメッセージにて前記第1のコマンドを発行するためのプログラムを起動することを特徴とする請求項22～24のいずれか1つに記載の通信装置。

【請求項30】 前記メッセージには、情報を送信する際の通信プロトコルを指定する情報が含まれていることを特徴とする請求項18および19および22および23および24のいずれか1つに記載の通信装置。

【請求項31】 前記第1のネットワークはIEEE1394であることを特徴とする請求項18および19および22および23および24のいずれか1つに記載の通信装置。

【請求項32】 前記第1のネットワークはLON (Local Operating Network)であることを特徴とする請求項18および19および22および23および24のいずれか1つに記載の通信装置。

【請求項33】 第1のネットワークに接続して該第1のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信制御方法において、

前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンドに対応する前記第2のネットワークの通信プロトコルに依存する第2のコマンドに関する情報を少なくとも前記第2のネットワークを介して提供し、この提供された第2のコマンドを含むメッセージを前記第2のネットワークを介して受信したとき、該メッセージに含まれる第2のコマンドを前記第1のコマンドに変換して、前記サービス提供装置を制御することを特徴とする通信制御方法。

【請求項34】 第1のネットワークに接続して該第1

のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信制御方法において、

前記サービス提供装置の提供するサービスに関する情報を収集して、前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンドを発行するためのホームページを作成し、このホームページを前記第2のネットワークを介して提供し、この提供されたホームページに基づくメッセージを前記第2のネットワークを介して受信したとき、該メッ  
10 セージに基づき発行された前記第1のコマンドで前記サービス提供装置を制御することを特徴とする通信制御方法。

【請求項35】 第1のネットワークと第2のネットワークに接続される通信装置であって、  
前記第1のネットワーク上の任意の装置の第1の論理多重識別子で提供されるサービスに第2の論理多重識別子を割り当て、前記第1の論理多重識別子とそのサービスを  
20 提供する前記第1のネットワーク上の装置の第1のアドレスと、前記第2のネットワークからアクセス可能な第2のアドレスと前記第2の論理多重識別子との対応関係を記憶する記憶手段と、

前記第1の論理多重識別子の各サービスを前記第2のネットワークから前記第2のアドレスと前記第2の論理多重識別子とでアクセスできるサービスとして提示する提示手段と、

前記記憶手段に記憶された対応関係に基づき、前記第1および第2のネットワーク間で前記提示手段で提示された前記第1のネットワーク上のサービスを提供するための  
30 パケット転送を行うことを特徴とする通信装置。

【請求項36】 前記第1のネットワーク上の前記第1の論理多重識別子と各サービスを提供する装置の第1のアドレスを収集する収集手段をさらに具備したことを特徴とする請求項35記載の通信装置。

【請求項37】 前記第2のネットワークから入力されるパケットのうち前記第1のネットワークへ転送可能なパケットの識別子を記憶する第2の記憶手段と、  
前記第2のネットワークから入力されるパケットのうち、前記記憶手段に記憶された識別子を有するパケットのみ前記第1のネットワークへ出力する出力手段と、  
40 を具備したことを特徴とする請求項35記載の通信装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、ホームネットワーク環境におけるディレクトリサービス、機器の遠隔操作、あるいは周辺装置を制御する機能を備えたコンピュータ等の通信装置、特に汎用バスに接続された多種の装置を制御する可能性があるコンピュータ等の通信装置、及び該通信装置により行われる通信制御方法、サービス  
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登録方法、サービス提供方法及び装置制御プログラム登録方法に関する。

【0002】

【従来の技術】 (1) 近年、マルチメディア技術の発展に象徴されるように、電子機器のデジタル化が急速に進行している。この傾向は、まずオフィス環境で始まっている。ハードウェアの面では、パソコンの導入、OA機器のデジタル化、それらのネットワーク化という形で進行している。ソフトウェアの面では、ホストによる基幹業務（これはライトサイジングされてパソコン等に移行されつつある）や、ワープロ、表計算などのソフトウェア、あるいはWWW等のインターネットアプリケーション等が導入されている。そして、デジタル化の適用分野は益々広まり、その発展はとどまるところを知らない。

【0003】 上記の傾向は、家庭内で使用される機器やその関連分野等においても見られる。すなわち、AV機器のデジタル化（すなわちDVD、デジタルVTR、デジタルビデオカメラ等）、放送のデジタル化、OCN等のインターネットアクセス等の導入など、デジタル化は着実に進行している。

【0004】 オフィス環境を始めとして推し進められてきた上記のような技術革新の波は、今後、ネットワーク化の方向へと向かっていくことが考えられる。すなわち、情報・通信・放送といった種々の分野の技術がデジタル化によって束ねられ、ネットワーク化によって相互乗り入れを始めていくと言われている。

【0005】 これを実現するための基盤となるネットワーク技術としては、種々の候補が考えられる。例えば、イーサネットは、オフィス環境にて圧倒的な実績を持っており、家庭でのパソコンネットワークにおいても、その最有力候補であると言える。また、ATMも有力な候補である。これは、インフラの構築側（電話会社やCATV等）が、高速、リアルタイム、広帯域といったATMの特徴に注目し、この技術を使ってインフラを構築していこうというのが一般的な動きだからである。

【0006】 これらの候補に加えて、最近、IEEE1394なるネットワーク技術（バス技術）が注目を集めている。これは、高速、リアルタイム（QOS保証）、プラグアンドプレイ等の数々の注目すべき特徴を持っており、特にAV機器産業界においてデジタルAV機器同士の接続方式の最有力候補として大変な注目を集めている。また、パソコンなどのコンピュータ産業界においても、この技術への注目が集まりはじめている。

【0007】 さて、情報・通信・放送等のネットワーク化による相互乗り入れは、まず家庭向けのデジタル機器の普及に伴い、ユーザに所望されるネットワーク技術によりそれらデジタル機器を相互接続することで実現されていくであろう。そのようにして徐々に家庭内デジタルネットワークのプロトタイプが生み出されていくと考えられる。

【0008】そして、その次の段階として、これらのデジタルネットワーク同士を相互に接続したいというニーズが顕在化してくると考えられる。例えば、ユーザ宅の1階の応接間の1394ネットワークに接続されたAV機器と、2階の部屋の1394ネットワークに接続されたAV機器とを、相互接続して、例えばダビング等、協調動作をさせようというようなニーズである。あるいは、ユーザA宅の1394ネットワークに接続された機器aと、ユーザB宅の1394ネットワークに接続された機器bとを協調動作させるような場合である。

【0009】しかしながら、家庭内あるいは家庭間デジタルネットワーク同士の相互接続を実現するためには、以下のような問題がある。

【0010】(i) 家庭内あるいは家庭間でネットワークを介した機器の制御を行おうという場合に、「ネットワーク上のどの位置に何の機器があるか」あるいは「ネットワーク上でどのようなサービスが提供されているか」といった情報を知るための機構が存在しない。この機構がないと、ユーザは、特定の機器／サービスの存在をネットワーク上で認識することができず、対象機器の操作もしくは制御を行いあるいはサービスの提供を受けることができない。

【0011】(ii) デジタルネットワーク同士の相互接続においては異なるプロトコルに従う部分が混在するものと想定されるが、異なるプロトコルを越えて操作コマンド等を伝える機構が存在しない。

【0012】例えばIEEE1394を用いた場合に1394対応機器の他にインターネット対応機器等が混在することが可能であり、必ずしもその使用プロトコルは一致しない。そのような混在状況において遠隔操作を行なおうとした場合、すなわち異なる種別のネットワークを介して対象機器を制御しようとする場合、異なる種別のネットワークではIEEE1394プロトコルを稼動することができないため、操作コマンドの送付が不可能である。

【0013】また、ゲートウェイを設けて遠隔操作等を実現する方法も考えられるが、このような場合におけるゲートウェイの設計指針等は存在しない。

【0014】(2) ところで、近年の急速なパーソナルコンピュータの普及とアプリケーションの多様化に伴い、その周辺機器は、例えばハードディスクのようなストレージ装置やスキャナ、カメラのような入力装置などに多様化しその種類は増え続けている。

【0015】過去においてはアプリケーションソフトウェアと周辺機器ハードウェアの両方の汎用性がなく、周辺機器は特定のアプリケーションからのみ使用でき、他から利用できない不便さがあった。この障害は現在では主として次の3つの技術によりかなりの部分解消されている。その技術とはハードウェアの制御の違いを吸収するドライバと呼ばれるソフトウェアと、必要に応じてド

ライバを読み込みオペレーティングシステム（以下、OSと呼ぶ）に組み込むことのできるローダブルドライバの技術、そして接続された周辺機器をコンピュータ自身が検出して適切なドライバを組み込むプラグアンドプレイの技術である。

【0016】これにより周辺機器とアプリケーションプログラムとがともに汎用性が高まり、利用者の利便性が向上するとともに、汎用性にともなう量産効果によって価格も低下する正のフィードバックを生む結果となった。もちろんパーソナルコンピュータにおいてはハードウェア自体、ISA、PCIなどのバス規格、IDEやSCSIといったストレージ装置の接続規格によって標準化されて来たこともこれを助けている。

【0017】最近ではUSB(Universal serial Bus)やIEEE1394といった接続作業と配線の取り回しが容易な周辺装置の接続規格が採用されつつある。これらは数対のより対線の接続なので簡易なネットワークとしても利用が可能である。IEEE1394は過去のコンピュータのシステムバスに匹敵する高速な転送能力を備え、画像伝送が可能なことからTV、ビデオなどの家電機器の接続規格としても有力である。また、IEEE1394規格では制御は全てIEC1212(ANSI/IEEE Std 1212 Control and Status Register(CSR) Architecture for Microcomputer Buses[ISO/IEC13213])で規格化された64ビット形式のアドレス空間にマッピングされたレジスタに対する読み書きによって行われる。このため、ストレージデバイスで多く使われているSCSI規格と同様に制御するホストプロセッサのアーキテクチャに依存しないインターフェースを周辺機器が持つことができる。

【0018】一方、上記した汎用化が利点となる前提条件は多種の周辺機器に対応したドライバがOSとともに提供されることである。これにはOSのベンダと周辺機器のベンダがともに大きな労力を割かねばならない。実際、Microsoft社のオペレーティングシステム、Windows95では40枚に及ぶフロッピーディスクに多種のドライバが収納されている。もちろんこの全てがドライバではないものの、全体に占める割合は少なくない。ドライバソフトのソフトウェアはOSに依存するため、ソフトベンダはOSごとにドライバを用意しなければならない。デバイスドライバは一般にOSのメモリ管理と密接に関連して動作しているためである。OS自体がホストプロセッサのアーキテクチャに依存する部分の大きいことはいうまでもない。

【0019】デバイスドライバの汎用性を高める試みとして、SCSIやIEEE1394、USBで実現されているように、周辺機器との通信や制御に汎用のプロトコルを使う方法がある。OSがSCSIやIEEE13

94のパケットを送信するドライバを提供し、そのドライバを利用して機器固有のデバイスドライバがそれぞれの周辺機器を制御する方式である。この方式をとれば同一のOSではSCSIやIEEE1394などの装置接続インタフェースが異ってもSCSI HDやプリンタなどの装置固有の制御を行う部分のドライバは共通に使うことができる。

【0020】このような汎用の接続装置アーキテクチャにもいくつかの方法がある。SCSIでは通信に加えて制御コマンドのプロトコルも規定されている。IEEE 1394では通信方法は規定されているが、制御のコマンドまでは規定せず、さまざまな制御プロトコルを持つ機器の余地を残している。

【0021】また、IEEE1394には汎用入出力バスとしての側面の他にネットワークとして利用できる側面があり、IEEE1394バス上へのインターネットプロトコルのマッピングも提案されている(DAVIC I P over IEEE1394, 1995 Specifications, 1996)。しかしながら通信ネットワークの面と入出力バスとしての面を統合したインタフェースは未だ実現されていない。

【0022】さて、OSがそれぞれの機器に対応するドライバを読み込むことでさまざまな周辺機器が利用可能になっている。しかし、デバイスドライバ自体はOSに依存しており、汎用性を持たないために種々のOS毎にそれぞれ対応のドライバの開発が必要であった。このため周辺機器ベンダによるデバイスドライバの開発が特定の良く普及したOSに限られてしまう問題があった。この結果として、デバイスドライバの開発がある特定のOSに集中し、他のOSで使えないデバイスが増加している。これはOSの用途に合わせた多様化を妨げることになり、利用者の利便性を損うものである。

【0023】もう一つの問題は周辺装置が多様化することによって、利用しない装置のドライバや、上位プロトコルに対応するAPIにOSの資源が占有されてしまうことである。

【0024】また、IEEE1394では周辺機器制御バスのみならず、ネットワーク的な利用形態も考えられる。ネットワーク的に利用される場合、制御する側のPCが予め接続される装置をすべて把握することは困難であり、接続されている装置に応じて利用法を決定できることと、同一のIEEE1394バスに複数のPCが接続されているとき、どちらのPCが制御権を持つかを決定することが要求される。しかし、これを解決しているシステムは従来は存在しなかった。

【0025】また、電話網や広域ネットワークを通じて遠隔にあるIEEE1394装置を制御できるシステムも従来は存在しなかった。

【0026】

【発明が解決しようとする課題】従来、家庭内あるいは

家庭間デジタルネットワーク同士を相互接続し、ネットワークを介した機器の制御を行おうとしても、

(1) ネットワーク上に存在する各機器の位置あるいはネットワーク上で提供されているサービスに関する情報を知るための技術がなく、ユーザは、特定の機器/サービスの存在をネットワーク上で認識することができず、対象機器の操作もしくは制御を行いあるいはサービスの提供を受けることができなかった。また、デジタルネットワーク同士の相互接続において異なるプロトコルに従う部分が混在する場合、異なるプロトコルを越えて操作コマンド等を伝える技術がなく、ユーザは、異なるプロトコルを越えた対象機器の操作もしくは制御を行いあるいはサービスの提供を受けることができなかった。

【0027】(2) さらに、近い将来、家庭内にも種々のインターネット処理機能を持った、いわゆる情報家電が入り込んでくると考えられているが、現在のインターネットは深刻なアドレス不足に悩んでいる。家庭内に入り込んでくる家電機器は、非常に多くの数になるものと考えられ、これら全てに新たにIPアドレスを考えるのは非現実的である。そこで、以下のような2つの方法が提案されている。

【0028】・家庭内はプライベートIPアドレスを用いる。

【0029】・家庭内は、IPv6(IPバージョン6)アドレスを用いる。

【0030】しかしながら、実際のインターネット(公衆網)はIPv4(IPバージョン4)で運用されているのが現実であり、上記のような方法を取った場合、インターネット上から家庭内の機器へアクセスする方法が無い。この問題に対する対処方法としては、NAT(ネットワークアドレス変換)やIPマスカレードが知られているが、これらを用いたとしても、インターネット(公衆網)上のユーザは、家庭内の種々の機器のアドレスを、実際にそれらの操作を行おうとする以前に認識する必要があるが、これを実現するメカニズムは無い。

【0031】(3) また、従来、デバイスドライバはOSに依存しており汎用性を持たないために、種々のOS毎にそれぞれ対応のドライバの開発が必要である問題点があった。また、周辺装置が多様化することによって、予めデバイスドライバを豊富に内蔵しておくことが良く行われるが、利用しない装置のデバイスドライバや、上位プロトコルに対応するAPIにOSの資源が無駄に占有されてしまう問題点があった。

【0032】本発明は、上記事情を考慮してなされたもので、上記第1の問題点を解決するために、特定のネットワークに依存せず、統一的なサービス提供環境を実現することが可能な通信装置、サービス登録方法およびサービス提供方法を提供することを目的とする。

【0033】また、上記第2の問題点を解決するため、本発明は、アドレス体系の異なるネットワーク(例

例えば、IPv4とIPv6、プライベートアドレスとIPv4、プライベートアドレスとIPv6等)を相互接続した場合でも、各ネットワークにおいて提供されているサービスを他のネットワークからでもアクセス可能にする通信装置を提供することを目的とする。

【0034】また、上記第3の問題点を解決するために、本発明は、OSやハードウェアに依存せず、必要の生じた時点で装置制御プログラムを登録することの可能な通信装置および装置制御プログラム登録方法を提供することを目的とする。

【0035】

【課題を解決するための手段】(1)本発明(請求項1)は、単一アドレス空間にマップされたレジスタの操作を行う通信手段と、自装置に関する構成情報を記憶する構成情報記憶手段(コンフィグレーションメモリ)とを備えた通信装置(例えば、パーソナル・コンピュータ等)であって、前記構成情報記憶手段には、自装置(当該通信装置)上で稼動するサービスに関する情報を動的に記述することを特徴とする。

【0036】本発明によれば、通信装置を介して通信される他ノードは、この構成情報記憶手段をアクセスすることによって、その時点でその通信装置がサービスしているアプリケーションをタイムリに認識することができ、網構成のディレクトリサービスや、移動ノードのサービス検出が可能となり、網の運用の柔軟性が向上する。特に、動的に稼動サービスが変化する場合や、サービスがソフトウェアにより実現される場合には、ソフトウェアのインストールや、バージョンアップ等に伴い、そのサービスの稼動の動的変化はより激しいものとなるため、サービス構成情報を動的に変化させることの有効性は極めて大きなものとなる。

【0037】本発明(請求項2)は、単一アドレス空間にマップされたレジスタの操作を行う通信手段と、自装置に関する構成情報を記憶する構成情報記憶手段(コンフィグレーションメモリ)とを備えた通信装置(例えば、パーソナル・コンピュータ等)であって、前記構成情報記憶手段には、自装置(当該通信装置)上で稼動するサービスに関する情報と、自装置の属性に関する情報(例えば、ベンダID、ノードケーパビリティ等)とを併せて記述することを特徴とする。

【0038】本発明によれば、通信装置を介して通信される他ノードに対して、サービスをベースとした構成情報と、装置をベースとした構成情報の両方を通知することができ、該他ノードがその通信装置が接続されるネットワークのディレクトリ情報を構成する際に、サービス別の構成情報とするか、装置別の構成情報とするかの選択をより簡略化するのに有効である。これは、サービス別の操作・検索になれているユーザと、装置別の操作・検索になれているユーザの両方が存在するため、その両方に対応するために、特に有益である。

【0039】本発明(請求項3)は、単一アドレス空間にマップされたレジスタの操作を行う第1の通信手段と、自装置に関する構成情報を記憶する構成情報記憶手段(コンフィグレーションメモリ)とを備えた通信装置(例えば、パーソナル・コンピュータ等)であって、前記構成情報記憶手段には、自装置(当該通信装置)に前記第1の通信手段とは異なる第2の通信手段を介して接続されたネットワークに関する構成情報(例えば、端末の情報、サービスの情報)の少なくとも一部を記述することを特徴とする。

【0040】本発明によれば、第1の通信手段に接続された当該通信装置以外のノードは、当該通信装置に第2の通信手段に接続されたネットワーク構成情報を、この構成情報記憶手段を通して認識することが可能となり、この結果、相互接続されたネットワーク全体の構成情報を、第1の通信手段を介した構成情報記憶手段を通して認識することが可能となり、よって、網管理、網サービス登録などの仕組み、手間の簡略化を図ることが可能となる。

【0041】本発明(請求項4)は、接続されたネットワーク内に存在するディレクトリエージェントにサービスを登録する通信装置(例えば、パーソナル・コンピュータ等)であって、接続された前記ネットワークのデータリンクに依存するプロトコルで通信する、電子的装置(例えば、周辺機器、AV機器、家電機器等)のサービスを、該電子的装置に代わって前記ディレクトリエージェントに登録する手段を備えたことを特徴とする。

【0042】本発明によれば、ディレクトリエージェントは、それが稼動するプロトコル(例えばIP等のネットワークレイヤプロトコル等)のディレクトリサービスに対して、データリンクレイヤプロトコル(例えばIEEE1394レイヤ等)で提供されるサービス(例えばIEEE1394のAV/Cプロトコル等)を登録することが可能となり、この結果、ディレクトリエージェントもしくはディレクトリサービスは、ネットワーク上で展開されているサービスを、その提供レイヤの区別なく、検索されることが可能となり、ネットワーク利用者の利便性の向上と、柔軟性の向上を同時に図ることが可能となる。

【0043】本発明(請求項5)は、接続されたネットワーク内のユーザエージェントからの問い合わせに応じてサービスに関する情報を通知する通信装置(例えば、パーソナル・コンピュータ等)であって、接続された前記ネットワークのデータリンクに依存するプロトコルで通信する、電子的装置(例えば、周辺機器、AV機器、家電機器等)のサービスを、該電子的装置に代わって前記ユーザエージェントに通知する手段を備えたことを特徴とする。

【0044】本発明によれば、ユーザエージェントは、それが稼動するプロトコル(例えばIP等のネットワー

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クレイアプロトコル等)のサービスロケーションサービスに対して、データリンクレイアプロトコル(例えばIEEE1394レイア等)で提供されるサービスに関する情報を得ることが可能となり、この結果、ユーザエージェントもしくはサービスロケーションサービスは、ネットワーク上で展開されているサービスを、その提供レイアの区別なく検索することが可能となり、ネットワーク利用者の利便性の向上と柔軟性の向上を同時に図ることができる。

【0045】本発明(請求項6)は、請求項4または5に記載の通信装置において、ディレクトリエージェントへの登録またはユーザエージェントへの通知の際に、登録または通知する前記サービスへのアクセスのためのポートとして、自装置(例えば、パーソナル・コンピュータ等)の論理多重識別子を登録または通知することを特徴とする。

【0046】このようにすれば、前記通信装置は、その論理多重識別子へのアクセスがあった場合には、前記電子的装置のサービスへのアクセスであることを認識することが可能となり、そのサービスを実際に実現するための適切な処理を施すことが可能となる。

【0047】一方、ディレクトリエージェントは、前記電子的装置のサービスへのアクセスポイントとして、この論理多重識別子を応答することが可能となり、もってサービスの提供レイアを問わない統一的なディレクトリサービスを提供することが可能となる。

【0048】また、ユーザエージェントは、前記電子的装置のサービスへのアクセスポイントとして、この論理多重識別子を通知された場合、レイアを問わず、そのサービスがこの論理多重識別子を通じて提供されるものと認識することとなり、ネットワーク全体で、レイアを問わない、統一的なサービス提供体制を提供することが可能となる。

【0049】本発明(請求項7)は、請求項6に記載の通信装置において、前記論理多重識別子で指定されたポートにコマンドが到達した場合に、このコマンドを、それに対応する前記データリンクに依存するプロトコルのコマンドに変換して、前記電子的装置(例えば、周辺機器、AV機器、家電機器等)に送信することを特徴とする。

【0050】このようにすれば、前記通信装置は、その論理多重識別子へのアクセスがあった場合には、前記電子的装置のサービスへのアクセスであることを認識し、実際にそのサービスを提供している実体に、その提供データリンクのプロトコルに合致したコマンド変換をした上で、そのコマンド送出を行うこと、すなわちサービス要求を行うことが可能となり、もって、全体の「サービス要求→サービス実現」の手順の実現を図ることが可能となる。

【0051】また、ユーザエージェントは、前記電子的

装置のサービスへのアクセスは、あくまで、そのコマンドを記述したレイアで行われるものと認識していることとなるため、処理の単純化、すなわち該レイアでのサービスアクセスの環境さえ整えておけば、該ネットワーク上の種々のサービスへのアクセスが可能となることを意味し、該ネットワークのサービス提供環境の単純化、効率化、統一化の各々に寄与することが可能となる。

【0052】本発明(請求項8)は、請求項6に記載の通信装置において、前記論理多重識別子のポートに到達したコマンドを、該コマンドに対応する前記データリンクに依存するプロトコルのコマンドにマッピングするための対応テーブルを有することを特徴とする。

【0053】このようにすれば、前記通信装置は、その論理多重識別子へのアクセスがあった場合のコマンド変換を、あらかじめ決められた手順で行うことが可能となり、これによって、前記電子的装置のサービスへのアクセスであることを認識し、実際にそのサービスを提供している実体に、その提供データリンクのプロトコルに合致したコマンド変換をした上で、そのコマンド送出を行うこと、すなわちサービス要求を行うことが可能となり、もって、全体の「サービス要求→サービス実現」の手順の実現を図ることが可能となる。

【0054】また、ユーザエージェントは、前記電子的装置のサービスへのアクセスは、あくまで、そのコマンドを記述したレイアで行われるものと認識していることとなるため、処理の単純化、すなわち該レイアでのサービスアクセスの環境さえ整えておけば、該ネットワーク上の種々のサービスへのアクセスが可能となることを意味し、該ネットワークのサービス提供環境の単純化、効率化、統一化の各々に寄与することが可能となる。

【0055】本発明(請求項9)は、第1の通信手段に従えば通信できず、第2の通信手段に従えば通信可能な電子的装置と、第1の通信手段および第2の通信手段のいずれに従っても通信可能な電子的装置とが接続される可能性のあるネットワークに接続された通信装置におけるサービス登録方法であって、前記第1の通信手段を通じて前記電子的装置夫々から提供されるサービスに関する情報の登録を受け付け、前記第2の通信手段により存在が認識された電子的装置で、かつ、前記第1の通信手段を通じての前記通知がなかったものについて、登録すべき該電子的装置夫々により提供されるサービスに関する情報を前記第2の通信手段を用いて取得し、通知された前記サービスに関する情報および取得された前記サービスに関する情報をもとに、前記ネットワーク上のサービスディレクトリ情報を構成することを特徴とする。

【0056】本発明(請求項10)は、第1のプロトコルに従えば通信できず、第2のプロトコルに従えば通信可能な少なくとも1つの電子的装置が接続された通信装置におけるサービス提供方法であって、前記電子的装置により提供されるサービスへのアクセスのためのポート

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として前記第1のプロトコルに従う自装置の論理多重識別子を割り当て、前記論理多重識別子で指定されたポートにコマンドが到達した場合に、このコマンドを、前記第2のプロトコルに従うコマンドに変換して、前記電子的装置に送信することを特徴とする。

【0057】(2)本発明(請求項11)は、単一アドレス空間にマップされたレジスタの操作を行う通信手段と、前記通信手段によって認識された電子的装置(例えば、周辺機器、AV機器、家電機器等)の属性情報(例えば、unique ID、unit ID、capability等)を入手する入手手段と、前記通信手段に対して前記単一アドレス空間上のレジスタの操作を行う指示を発行することによって前記電子的装置を制御する装置制御プログラム(デバイスドライバソフト)の登録(OSへの組み込み)を、入手された前記電子的装置の属性情報に基づいて動作中に行う登録手段とを備えたことを特徴とする。

【0058】本発明によれば、前記装置制御プログラムがいわゆるデバイスドライバの役割を果たすことになるが、本発明によれば、単一アドレス空間にマップされたレジスタの操作を行う通信手段によって入手された電子的装置の属性情報に基づいて、前記単一アドレス空間上のレジスタの操作を行う指示を発行することによって前記電子的装置を制御する装置制御プログラムを登録するので、動作中に必要に応じて、ドライブする対象の属性にあわせた装置制御プログラムをOSに組み込むことができる。

【0059】また、装置制御プログラムがネットワークローダブルな形(例えばJAVAS言語で記述された形)で提供されれば、OSの種別やハードウェアの種別を問わずに、装置制御プログラムの登録を行うことが可能となる。

【0060】本発明(請求項12)は、請求項11に記載の通信装置において、前記登録手段は、前記入手手段により入手された前記電子的装置の属性情報に基づいて入手すべき装置制御プログラムの識別名を求める手段と、求められた前記識別名に基づいて、該当する装置制御プログラムを入手する手段とを有することを特徴とする。

【0061】このようにすれば、前記電子的装置の属性に適合した装置制御プログラムを、必要に応じて入手し、デバイスドライバとして使用することができる。

【0062】本発明(請求項13)は、請求項11または12に記載の通信装置において、前記電子的装置の属性情報は、前記電子的装置内の予め定められた構成情報記憶領域(例えば、コンフィグレーションROM、あるいはコンフィグレーション・メモリ)に記述されたものであり、前記入手手段は、前記構成情報記憶領域に記述された内容を読み取ることで前記属性情報を入手することを特徴とする。

【0063】このように前記電子的装置の属性情報を当該電子的装置内の構成情報記憶領域を読み取ることで入手するにすれば、構成情報記憶領域には通常そのデバイスの属性情報が記述されていることが期待され、適当な装置制御プログラムを入手するための手がかりとなる適切な情報が得られることが期待される。

【0064】本発明(請求項14)は、請求項11ないし13のいずれか1項に記載の通信装置において、前記単一アドレス空間は、IEEE1394バスの形で提供されることを特徴とする。

【0065】IEEE1394バスは単一メモリ空間を実現するバスとして解釈することが可能であることから、上記機構をそのまま採用することが可能であり、本来困難であったネットワークのデバイスドライバのネットワークを介した動的ローディングが可能になり、ユーザの利便性を飛躍的に高めることができる。

【0066】本発明(請求項15)は、請求項12ないし14のいずれか1項に記載の通信装置において、前記装置制御プログラムの識別名として、外部ネットワークの特定の資源を指示可能な識別名を用いることを特徴とする。

【0067】このように、前記電子的装置の装置制御プログラムをネットワークローダブルとすれば、必要に応じて外部ネットワークから入手することが可能になり、前記通信装置は、あらかじめ想定される全ての装置制御プログラムを持たなければいけないという制約条件から開放され、ディスクやOSの容量の節約、ソフトウェアのバージョンアップ等、様々な利点を享受することが可能となる。

【0068】好ましくは装置制御プログラムはJAVAS言語等で記述されたものである。

【0069】本発明(請求項16)は、単一アドレス空間にマップされたレジスタの操作を行う手段により所定の電子的装置と通信可能な他の通信装置(第2の通信装置)との間での通信が、論理ネットワークを利用した通信手段によって可能である通信装置(第1の通信装置)であって、前記通信手段を通じて前記他の通信装置(第2の通信装置)に対して前記電子的装置(例えば、パーソナル・コンピュータ、周辺機器、AV機器、家電機器等)の属性情報(例えば、unique ID、unit ID、capability等)の取得を要求する手段と、前記電子的装置を制御する装置制御プログラム(デバイスドライバソフト)の登録(OSへの組み込み)を、前記要求により前記他の通信装置から入手した前記電子的装置の属性情報に基づいて動作中に行う手段と、前記他の通信装置(第2の通信装置)との間で前記通信手段を通じて前記単一アドレス空間上のレジスタの操作を行う指示に関する情報を送受信する手段とを備えたことを特徴とする。

【0070】本発明によれば、制御主体である通信装置

(第1の通信装置)は、論理ネットワークを通じて接続された他の通信装置(第2の通信装置)を仲介として前記電子的装置を利用するための機能を持つことができ、単一アドレス空間上のレジスタの操作を行う制御プログラムを変更することなく単一アドレス空間上にマップされたレジスタの操作を行う手段に限らず論理ネットワークを通じて遠隔の電子的装置を制御することが可能になる。

【0071】好ましくは、前記要求により前記他の通信装置から入手した前記電子的装置の属性情報に基づいて動作中に行う手段は、入手された前記電子的装置の属性情報に基づいて入手すべき装置制御プログラムの識別名を求める手段と、求められた前記識別名に基づいて、該当する装置制御プログラムを入手する手段とを有するようによっても良い。

【0072】また、好ましくは、前記電子的装置の属性情報は、前記電子的装置内の予め定められた構成情報記憶領域に記述されたものであり、前記属性情報は前記他の通信装置(第2の通信装置)により前記構成情報記憶領域に記述された内容を読み取られることで入手されたものであっても良い。

【0073】また、好ましくは、前記単一アドレス空間は、IEEE1394バスの形で提供されても良い。

【0074】また、好ましくは、前記装置制御プログラムの識別名として、外部ネットワークの特定の資源を指示可能な識別名を用いても良い。

【0075】本発明(請求項17)は、通信装置の動作中に装置制御プログラムを登録する装置制御プログラム登録方法であって、単一アドレス空間にマップされたレジスタの操作を行う所定の通信手段によって認識された電子的装置の属性情報を入手し、前記通信手段に対して前記単一アドレス空間上のレジスタの操作を行う指示を発行することによって前記電子的装置を制御する装置制御プログラムの登録を、入手された前記電子的装置の属性情報に基づいて動作中に行うことを特徴とする。

【0076】なお、以上の各装置に係る発明は方法に係る発明としても成立する。

【0077】また、上記の発明は、相当する手順、機能あるいは手段をコンピュータに実行させるためのプログラムを記録した機械読取り可能な媒体としても成立する。

【0078】(3)本発明の通信装置(請求項18)は、第1のネットワークに接続して該第1のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信装置において、前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンドに対応する前記第2のネットワークの通信プロトコルに依存する第2のコマンドに関する情報を少なくとも前記第2のネットワークを介して提供する提供手段

と、この提供手段で提供された第2のコマンドを含むメッセージを前記第2のネットワークを介して受信する受信手段と、この受信手段で受信されたメッセージに含まれる第2のコマンドを前記第1のコマンドに変換し、該第1のコマンドで前記サービス提供装置を制御する制御手段と、を具備したことにより、特定のネットワークに依存せず、統一的なサービス提供環境を実現することが可能となる。

【0079】本発明の通信装置(請求項19)は、第1のネットワークに接続して該第1のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信装置において、前記サービス提供装置の提供するサービスに関する情報を収集する収集手段と、この収集手段で収集されたサービスに関する情報に対応する前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンドに対応する前記第2のネットワークの通信プロトコルに依存する第2のコマンドに関する情報を少なくとも前記第2のネットワークを介して提供する提供手段と、この提供手段で提供された第2のコマンドを含むメッセージを前記第2のネットワークを介して受信する受信手段と、この受信手段で受信されたメッセージに含まれる第2のコマンドを前記第1のコマンドに変換し、該第1のコマンドで前記サービス提供装置を制御する制御手段と、を具備したことにより、特定のネットワークに依存せず、統一的なサービス提供環境を実現することが可能となる。

【0080】本発明の通信装置(請求項22)は、第1のネットワークに接続して該第1のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信装置において、前記サービス提供装置を制御するための前記第1のネットワークの通信プロトコルに依存する第1のコマンドを発行するためのホームページを前記第2のネットワークを介して提供する提供手段と、この提供手段で提供された前記ホームページに基づくメッセージを前記第2のネットワークを介して受信する受信手段と、この受信手段で受信されたメッセージに基づき発行された前記第1のコマンドで前記サービス提供装置を制御する制御手段と、を具備したことにより、ホームページを受信し操作を行うユーザは、第1のネットワークに接続されたサービス提供装置のプロトコルが何であるかを問わず、具体的にはIEEE1394に接続されるAV機器のように、リンクレイヤ技術に依存するプロトコルしか解釈しない機器についても、遠隔制御を行うことが可能となる。

【0081】本発明の通信装置(請求項23)は、第1のネットワークに接続して該第1のネットワークに依存するプロトコルで通信するサービス提供装置を第2のネットワークを介して制御するための通信装置において、



前記サービス提供装置の提供するサービスに関する情報を収集する収集手段と、この収集手段で収集されたサービスに関する情報に対応する前記サービス提供装置を制御するための前記第 1 のネットワークの通信プロトコルに依存する第 1 のコマンドを発行するためのホームページを前記第 2 のネットワークを介して提供する提供手段と、この提供手段で提供された前記ホームページに基づくメッセージを前記第 2 のネットワークを介して受信する受信手段と、この受信手段で受信されたメッセージに基づき発行された前記第 1 のコマンドで前記サービス提供装置を制御する制御手段と、を具備したことにより、ホームページを受信し操作を行うユーザは、第 1 のネットワークに接続されたサービス提供装置のプロトコルが何であるかを問わず、具体的には IEEE 1394 に接続される AV 機器のように、リンクレイヤ技術に依存するプロトコルしか解釈しない機器についても、遠隔制御を行うことが可能となる。

【0082】本発明の通信装置（請求項 24）は、第 1 のネットワークに接続して該第 1 のネットワークに依存するプロトコルで通信するサービス提供装置を第 2 のネットワークを介して制御するための通信装置において、前記サービス提供装置の提供するサービスに関する情報を収集する収集手段と、この収集手段で収集されたサービスに関する情報に基づき前記サービス提供装置を制御するための前記第 1 のネットワークの通信プロトコルに依存する第 1 のコマンドを発行するためのホームページを作成する作成手段と、この作成手段で作成されたホームページを前記第 2 のネットワークを介して提供する提供手段と、この提供手段で提供された前記ホームページに基づくメッセージを前記第 2 のネットワークを介して受信する受信手段と、この受信手段で受信されたメッセージに基づき発行された前記第 1 のコマンドで前記サービス提供装置を制御する制御手段と、を具備したことにより、ホームページを受信し操作を行うユーザは、第 1 のネットワークに接続されたサービス提供装置のプロトコルが何であるかを問わず、具体的には IEEE 1394 に接続される AV 機器のように、リンクレイヤ技術に依存するプロトコルしか解釈しない機器についても、遠隔制御を行うことが可能となる。

【0083】なお、本発明の通信装置（請求項 25）は、前記サービス提供装置の提供するサービス毎に予め定められた前記第 1 のコマンドに対応する該サービス提供装置を制御するための前記第 2 のネットワークの通信プロトコルに依存する第 2 のコマンドを登録したテーブルを具備し、前記収集手段で収集されたサービスに関する情報に対応する第 2 のコマンドに関する情報を該テーブルから取得して前記ホームページを作成することにより、ホームページには、第 2 のコマンド情報（遠隔制御コマンド）により実現できるサービス提供装置の遠隔制御の一覧を表示することが可能になり、もって運用可能

な遠隔制御方法を列挙したホームページを作成することが可能になる。

【0084】また、本発明の通信装置（請求項 26）は、前記メッセージは、前記サービス提供装置を制御するための前記第 2 のネットワークの通信プロトコルに依存する第 2 のコマンドを含み、前記制御手段は、前記第 1 のコマンドと前記第 2 のコマンドとの対応テーブルを参照して前記受信手段で受信されたメッセージに含まれる第 2 のコマンドを前記第 1 のコマンドに変換することにより、特定の第 2 のコマンド情報（遠隔制御コマンド）を前記受信手段を介して受信した場合に、それがどのような動作を第 1 のネットワークの所望の装置（この場合第 1 のネットワークに接続されたサービス提供装置）に行えばいいのかを、上記対応テーブルを参照すればわかるようになる。

【0085】また、本発明の通信装置（請求項 27）は、前記メッセージは、前記サービス提供装置を制御するための前記第 2 のネットワークの通信プロトコルに依存する第 2 のコマンドと、前記第 2 のネットワークの通信プロトコルに依存するアドレスと、前記第 1 のネットワークに依存する前記サービス提供装置を特定するための多重識別子とを含み、前記制御手段は、前記第 1 のコマンドと前記第 2 のコマンドとの対応テーブルを参照して前記受信手段で受信されたメッセージに含まれる第 2 のコマンドを前記第 1 のコマンドに変換し、該第 1 のコマンドで前記多重識別子にて識別されるサービス提供装置を制御することにより、ホームページを受信したノードは、第 2 のコマンド情報（遠隔制御コマンド）として、ハイパーリンク参照された対象に働きかけることによって、制御対象である前記第 1 のネットワークに接続されたサービス提供装置を指定し、その所望の動作を指定することが可能となり、もって所望の前記第 1 のネットワークに接続されたサービス提供装置の遠隔操作を行うことが可能になる。

【0086】また、本発明の通信装置（請求項 28）は、前記ホームページは、前記サービス提供装置を制御するための前記第 2 のネットワークの通信プロトコルに依存する第 2 のコマンドを含むメッセージを生成するためのプログラムを含み、前記制御手段は、前記第 1 のコマンドと前記第 2 のコマンドとの対応テーブルを参照して前記受信手段で受信されたメッセージに含まれる第 2 のコマンドを前記第 1 のコマンドに変換し、該第 1 のコマンドでサービス提供装置を制御することにより、ホームページを受信したノードは、それに対応付けられたプログラム（JAVA プログラム）を起動させ、制御対象である前記第 1 のネットワークに接続されたサービス提供装置を指定し、その所望の動作を指定するコマンドを発行させることが可能となり、もって所望の前記第 1 のネットワークに接続されたサービス提供装置の遠隔操作を行うことが可能になる。

【0087】また、本発明の通信装置（請求項29）は、前記制御手段は、前記受信手段で受信されたメッセージにて前記第1のコマンドを発行するためのプログラム（例えば、CGIスクリプト）を起動することにより、ホームページを受信したノードは、それに対応付けられたプログラム（CGIスクリプト）を起動させ、制御対象である前記第1のネットワークに接続されたサービス提供装置を指定し、その所望の動作を指定するコマンドを発行させることが可能となり、もって所望の前記第1のネットワークに接続されたサービス提供装置の遠隔操作を行うことが可能になる。

【0088】また、本発明の通信装置（請求項30）は、前記メッセージには、情報を送信する際の通信プロトコルを指定する情報が含まれていることにより、前記ホームページを受信した相手ノードからの要求を受けて情報を送信する際に、その送出方法を特定することが出来るようになり、もって送信相手に確実に情報を送り届けることが出来るようになる。これは、送信すべき相手が、ネットワークレイヤパケットの受信能力の無い場合に特に有効である。また、送信情報を受信するノードが第2のコマンド情報（遠隔制御コマンド）と同一のネットワークレイヤプロトコルをサポートしていない場合や、送信情報のネットワークレイヤプロトコルへのカプセル化に多大なコストがかかる場合などにおいて、ネットワークレイヤプロトコル以外での情報送信を前記ホームページを受信した装置は促すことが可能になる。

【0089】さらに、前記メッセージに、情報を送信する際の通信プロトコルを指定する情報の他に、情報を送信する際の該通信プロトコルに依存するヘッダ情報が含まれていてもよい。

【0090】本発明の通信装置（請求項35、第5の実施形態）は、第1のネットワークと第2のネットワークに接続される通信装置であって、前記第1のネットワーク上の任意の装置の第1の論理多重識別子で提供されるサービスに第2の論理多重識別子を割り当て、前記第1の論理多重識別子とそのサービスを提供する前記第1のネットワーク上の装置の第1のアドレスと、前記第2のネットワークからアクセス可能な第2のアドレスと前記第2の論理多重識別子との対応関係を記憶する記憶手段と、前記第1の論理多重識別子の各サービスを前記第2のネットワークから前記第2のアドレスと前記第2の論理多重識別子とでアクセスできるサービスとして提示する提示手段と、前記記憶手段に記憶された対応関係に基づき、前記第1および第2のネットワーク間で前記提示手段で提示された前記第1のネットワーク上のサービスを提供するためのパケット転送を行うことにより、第1のネットワークが、第2のネットワークと異なるアドレス体系、例えば第2のネットワークがIPv4のアドレス体系で運用されている場合に、第1のネットワークがIPv6のアドレス体系で運用される場合や、第1のネ

ットワークがプライベートIPアドレスの体系で運用されている場合などにおいて、第2のネットワークのユーザに対して、第1のネットワークで提供されているサービスへのアクセスを実現することができる。

【0091】即ち、第2のネットワークのユーザに対しては、前記提示手段としての例えばホームページを用いて、前記第1のネットワークで提供されているサービスが本通信装置が提供しているものとして、第2のネットワークに対して提示する。前記第2のネットワークのユーザからのこのサービスへのアクセスがあった場合は、前記記憶手段に記憶された対応関係（アドレス・ポート番号変換テーブル）を用いて、前記第2のネットワークのユーザと本通信装置間のパケットを、本通信装置と前記第1のネットワークで提供されているサービス間のパケットに変換することで、前記第2のネットワークのユーザ、及び前記第1のネットワークで提供されているサービスからは透過的なパケットのやり取りを行っていることと認識されることになる。

【0092】（請求項36）前記第1のネットワーク上の前記第1の論理多重識別子と各サービスを提供する装置の第1のアドレスを収集する収集手段をさらに具備したことにより、前記第1のネットワークのサービスについての収集情報をもとに、前記提示手段としての例えばホームページの自動更新を行うことが可能となる。

【0093】（請求項37）前記第2のネットワークから入力されるパケットのうち前記第1のネットワークへ転送可能なパケットの識別子を記憶する第2の記憶手段と、前記第2のネットワークから入力されるパケットのうち、前記記憶手段に記憶された識別子を有するパケットのみ前記第1のネットワークへ出力する出力手段と、を具備したことにより、予めユーザ認証を行うなどして、公衆網等の外部ネットワークから前記第1のネットワークへの不正パケットの侵入を防ぐことができる。

【0094】

【発明の実施の形態】以下、図面を参照しながら発明の実施の形態を説明する。

【0095】（第1の実施形態）図1に本実施形態に係るシステムの構成例を示す。

【0096】本実施例では図1に示すように公衆網2を介して2つの家庭内ネットワークが相互接続されているものとする。公衆網2は、電話網でもよいし、ISDN等の広い帯域の回線、あるいは専用線のようなものであってもよいし、インターネットであってもよい。ただし、好ましくは、サービスの利用・提供に必要な通信帯域を満足する網を利用する。

【0097】第1の家庭内ネットワークは、第1のIEEE1394バス1から構成されている。また、このIEEE1394バス1には第1のAV接続装置4、パーソナル・コンピュータ（以下、PC）6、デジタルTV7が接続されているものとする。

【0098】第2の家庭内ネットワークは、第2のIEEE1394バス3と、ホームオートメーション網12から構成されている。本実施形態では、このホームオートメーション網12には、エシェロン社のLON（ローカルオペレーティングネットワーク）を用いるものとする。エシェロン社のLONについては、例えばエシェロン社のホームページ（http://www.echelon.com）等から得られるの情報に詳しく記述されている。

【0099】第2の家庭内ネットワークのIEEE1394バス3には、第2のAV接続装置5、DVDプレーヤ8、デジタルVTR9、PC10、プリンタ11が接続されているものとする。また、PC10はホームオートメーション網12にも接続されている。ホームオートメーション網12は、PC10のほかに、エアコン13と、電子レンジ14にも接続されている。

【0100】これらのネットワークに接続されている端末群のうち、第1のAV接続装置4、PC6、第2のAV接続装置5、PC10、プリンタ11は、それぞれIPアドレス（ここではプライベートIPアドレスとする）を持っており、いわゆるIP端末である。第1のAV接続装置4のIPアドレスは192.168.2.254、PC6のIPアドレスは192.168.2.1、第2のAV接続装置5のIPアドレスは192.168.1.254、PC10のIPアドレスは192.168.1.1、プリンタ11のIPアドレスは192.168.1.2であるものとする。このように、本実施形態における端末のIPアドレスにはプライベートIPアドレス（公衆網2がインターネットではなくISDN等である場合）またはグローバルIPアドレス（公衆網2がインターネットである場合）を使用しており、

各々の端末間のルーティングのためのルーティング機構の設定（IPルーティングテーブルの設定など）は適切に行われているものとする。なお、現在グローバルIPアドレスは32ビットであるが、近い将来に128ビットになる見込みであり、各端末にグローバルIPアドレスを割り当て可能な環境は現実のものとなりつつある。

【0101】一方、デジタルTV7、DVDプレーヤ8、デジタルVTR9は、いわゆる1394端末であり、1394プロトコル群（IEEE1394-1995、IEC1883、IEEE1394AV/C、SBPなど）のみを解釈する端末である。

【0102】また、エアコン13、電子レンジ14は、いわゆるLON端末であり、LONで定められたプロトコル群のみを解釈する端末である。

【0103】第1のAV接続装置4および第2のAV接続装置5は、それぞれ、2つ以上のネットワーク（本実施形態の場合IEEE1394バスと公衆網）の間を相互接続する機能を基本的に有する。図2に、本AV接続装置4、5の内部構成を示す。

【0104】図2に示されるように本実施例のAV接続装置は、1394インタフェース21、データリンクスイッチ22、公衆網インタフェース23、IP処理機能24、FANP処理機能25、1394/IPサービスロケーション処理機能26、サービスロケーション代理機能27、1394AVコマンド処理機能28、1394/IPコマンド変換機能29を有する。これらの各機能は、それぞれ、ハードウェアにより実現してもよいし、ソフトウェアにより実現してもよい。

【0105】1394インタフェース21は、1394バスとのインタフェースとなる機能である。

【0106】データリンクスイッチ22は、ネットワーク間をまたがるデータ転送を行うためのスイッチであり、より詳しくは、データリンクレイヤ識別子/情報のみの参照（例えば同期チャネル識別子や、ATM-VC1、伝送波長などの参照）によって、明示的にそのデータの転送先が予め判るように、例えばFANPなどのプロトコルによって設定をしておき、1394バスから入力されたデータを公衆網に転送しおよび公衆網から入力されたデータを1394バスに転送するためのスイッチである。

【0107】公衆網インタフェース23は、公衆網とのインタフェースとなる機能である。例えば、公衆網のデータリンクレイヤがATMであれば、物理的にはATMのインタフェースを、論理的にはATMシグナリングの機能などを持つことになる。

【0108】IP処理機能24は、TCP/UDP/IPなど、一連のインターネットプロトコル（TCP/IPプロトコルスイート）の諸機能である。

【0109】FANP処理機能25は、データの伝送経路のデータリンクレイヤでの帯域や仮想伝送路識別子の確保、整合を行う機能である。なお、FANP処理機能の詳細は例えば文献「『レジデンシャル環境におけるネットワーク相互接続方式』、電子情報通信学会、情報ネットワーク研究会研究報告IN97-19、pp.73-78、1997年」（あるいは特願平8-264496、特願平8-272672、特願平9-52125）等にて説明されている。

【0110】FANP処理機能25は、映像データ等のようにある程度広い帯域を保証する必要のあるサービスを扱う場合には設けることが望ましいものであり、帯域保証を必要としない場合には省いても構わない。なお、FANP処理機能の代わりにRSVPプロトコル（Resource ReSerVation Protocol；インターネットドラフトのdraft-ietf-rsvp-spec-08.txt）に従った処理機能等を用いることも可能である。

【0111】また、提供するサービスに応じてFANP処理機能25等の使用を制御するようにしてもよい。例えば、IPアドレスとポート番号の組毎にFANP処理

機能25等を使用するか否かを決定するようにしてもよい。あるいは、ユーザからの明示的な要求により使用することを決定するようにしてもよい。

【0112】1394/IPサービスロケーション処理機能26は、1394バスに接続された端末あるいはサービスを検索しあるいはその登録を受け、1394バス上にどのような端末/サービスが存在しているのかを認識し、要求された場合など必要に応じてその情報を外部に通知する機能を持つ。1394/IPサービスロケーション処理機能26は、少なくともサービスロケーションプロトコル（インターネットドラフトのdraft-ietf-svrloc-protocol-16.txt）の処理機能を持つ。

【0113】サービスロケーション代理機能27は、公衆網側に対して、IPベースのサービスロケーションの形でサービスロケーションプロトコルを稼動する。また、1394バスに接続されたサービスあるいは端末、すなわちIPベースではなく、一連の1394プロトコルしか認識、処理できないIEEE1394専用プロトコル端末/サービス（第1の家庭内ネットワークではデジタルTV7、第2の家庭内ネットワークではDVDプレーヤ8とデジタルVTR9）についても、本AV接続装置がそれらサービスあるいは端末の代理サーバとなって、それら端末/サービスを広告する機能を持つとともに、これら広告されたサービスを公衆網側（一般的にはIP側）から受け取った場合に、それらをIEEE1394のコマンドあるいはサービスにマッピングすべく1394・IPコマンド変換機能29に通知する機能を持つ。

【0114】1394AVコマンド処理機能28は、IEEE1394の端末制御プロトコル（たとえば1394AV/Cプロトコルや、SBPなど）の処理機能である。

【0115】1394/IPコマンド変換機能29は、IPを使って送られてきたあるいは送る制御コマンド（例えばRTSP（Real Time Stream Protocol）など；なお、RTSPについては、例えばインターネットドラフトdraft-ietf-mmusic-rtsp-02.psにて詳しく説明されている）と、1394バス上を送られるIEEE1394の端末制御コマンド（例えば1394AV/CプロトコルやSBPのコマンド）を相互に変換して、相手側に通知する機能を持つ。

【0116】次に、第2の家庭内ネットワークにおいて、第2のAV接続装置5が、第2の家庭内ネットワークに関する情報を取得する手順、すなわち第2の家庭内ネットワーク上に存在する端末およびサービスを認識する手順について説明する。

【0117】図3にIEEE1394特有の機構を用いた端末/サービス収集手順のシーケンスの一例を示す。

1394バスに接続される端末には、それぞれ、その端末についての所定の情報が書き込まれたコンフィグレーションROMが格納されている。図3では、第2のAV接続装置5は、1394バス3につながる各装置8～11のコンフィグレーションROMの読み込み（リード）を行い、各装置8～11の情報収集を行う。この情報収集は、1394バス3につながる端末すべてに対して行ってもよい。

【0118】以下では、コンフィグレーションROMに記述する情報についていくつかの例を示す。ここでは、PC10のコンフィグレーションROMを例にとって説明する。なお、本実施例では、IEEE1394の仕様書にならい「ROM」という語句を用いているが、実際には「レジスタ」あるいは「メモリ空間の一部」と認識されればよく、ROMでない場合（RAM等の場合）も含むものとする。

【0119】図4に、コンフィグレーションROMに記述する情報の第1の例を示す。この例では、コンフィグレーションROMには、その端末についての基本的情報であるノード情報（例えばベンダID、ノードケーパビリティなど）（図4中31）の他に、ユニット情報として、そのPC10が行うサービスを記述するものである。すなわち、このPC10は、WWWサーバ、デジタルアルバムサーバ機能を有しており、これらがコンフィグレーションROMの内容に反映されている（図4中32、33）。このようにコンフィグレーションROMに記述しておくことによって、1394バスにつながる他の端末に対して、自身がどのような端末であるのかを説明するだけでなく、自身がどのようなサービスを行っているかを知らしめることが可能となる。この機能は、特にPCのように、一つの端末に複数の機能が実現されているような場合にきわめて有益である。具体的にコンフィグレーションROMに記述される情報としては、サービス種別、そのサービスの属性（そのサービスを受けるために使用する種々のパラメータ等で、例えば最大データ転送速度、装置仕様、設定パラメータ等）などである。

【0120】ところで、PC10は、ホームオートメーション網12にも接続されており、これらのホームオートメーションのサーバともなっている。つまり、ホームオートメーション網12につながる各種機器（ここではエアコン13と電子レンジ14）の制御はこのPC10が行う構成となっている。言い換えると、このPC10にアクセスすることにより、第2の1394バス3につながる端末は、ホームオートメーション12網につながる各種機器の制御を行うことができることを意味する。このことを、第2の1394バス3上の端末に知らしめるために、ホームオートメーション網12についての情報（サービス情報）もPC10のコンフィグレーションROMに格納している。

【0121】まず、ホームオートメーションサービスを行っていることを示す情報がコンフィグレーションROMに格納されている(図4中34)。1394バス上では、これを一つのユニットであると認識させてもよい。次に、このユニット依存ディレクトリとして、エアコンサービス、電子レンジサービスが提供されていることを示す情報がそれぞれコンフィグレーションROMに記述されている(図4中35、36)。このようにすることにより、1394バスにつながる他の端末は、1394バスではない別のネットワークに接続されたサービスについて、どのようなサービスがどのように行われているのかを知ることができるようになり、サービスの認識やその操作性の大幅な向上が見込まれる。

【0122】次に、図5に、コンフィグレーションROMに記述する情報の第2の例を示す。第1の例では、コンフィグレーションROMには、その端末についてのユニット情報として、その端末が行うサービスについての記述が行われていたのに対して、第2の例では、サービスについての記述(図5中45~50)の他に、端末別の情報も記述してある(図5中42~44)。これらは、それぞれユニット情報として格納されており、それぞれユニット依存ディレクトリとして格納されていてもよい。また、端末別の情報とサービス別の情報であることを区別するために、それらの区別(どちらのユニットか)を示す領域(それぞれ図5中42、45)が存在してもよい。

【0123】ここでは、端末別情報として、PC10にホームオートメーション網12を介して接続されている端末(エアコン13と電子レンジ14)についての情報がそれぞれ格納されている(図5中43、44)。これらを参照することによって、他の1394ノードは、1394バスにつながるノードばかりでなく、その1394バスにつながるノードに接続された他のノード(本実施例ではエアコン13と電子レンジ14)についての情報も、1394レベルで得ることが可能となり、家庭内ネットワークの統合的な管理や制御にきわめて有効である。

【0124】また、第1の例と同様に、このPC10は、WWWサーバ、デジタルアルバムサーバ機能等を有する場合、これらがコンフィグレーションROMに反映される(図5中45~50)。その記述の具体的ルールは、基本的に第1の例と同様である。

【0125】次に、図6に、コンフィグレーションROMに記述する情報の第3の例を示す。この例は、PC10自身についての情報のみを格納する場合である。この場合は、第1の例や第2の例と異なり、サービスをベースとした記述ではなく、ノードとしての情報すなわち自身についての装置としての情報のみを記載することになるので、ユニット情報としては、自身がPCあるいはPCボード(例えば1394PCIボード)である旨が記

載される。

【0126】さて、前述のようにして第2のAV接続装置5にて収集された第2の家庭内ネットワーク上の端末／サービス情報を、例えば当該第2のAV接続装置5のコンソール上に表示することにより、ユーザにその操作を促すことができる。その際の表示方法として、サービス別の表示を行うことも可能であるし、端末ベースの表示を行うことも可能である。

【0127】図7にサービス別の表示を行う場合の画面例を示す。図7のように、第2の家庭ネットワーク上に展開されているサービス別に1つずつアイコン(i1~i7)が用意され、ユーザは所定のユーザインタフェースにより使用したいサービスを指示することで(例えばマウス装置を用いてクリックしあるいはドラッグアンドドロップすることで)、そのサービスにアクセスすることが可能となる。

【0128】ここで、図7のサービス別のアイコンの画面表示は、ネットワークの種別を問わず、第2のIEEE1394バス3に接続されたサービスも、ホームオートメーション網12に接続されたサービスも区別なく同様に表示されている。これは、一般にユーザにとってはそのサービスがどの物理ネットワークにつながっているかどうかは関心が無いため、上記のように区別なく表示するのが好ましいと考えられるからである。これによってユーザに物理ネットワークを意識させた場合に生じるであろう混乱を防止することができる。

【0129】なお、画面には必ずしもコンフィグレーションROMに書き込んである情報そのものを表示させる必要は無く、対応する別の情報を表示するようにしてもよい。例えば、コンフィグレーションROMに書き込まれている情報は、一般的に専門家向けのコードであることが多いと考えられ、一般ユーザにはなじみの薄い用語であることが多いと考えられる。具体例を挙げると、コンフィグレーションROMに「デジタルVCR」を意味するコードが書かれていたとしても、日本人にはこの用語はなじみが薄い。そこでこのような場合、「デジタルVCR」の代わりに、一般ユーザによりなじみ深い「ビデオ」あるいは「ビデオデッキ」等と表示するようにしても良い。

【0130】次に、図8に端末別の表示を行う場合の画面例を示す。サービス別の場合と同様に、第2の家庭ネットワーク上に展開されている端末別に1つずつアイコン(i11~i15)が用意され、ユーザは所定のユーザインタフェースにより使用したいサービスを指示することで(例えばマウス装置を用いてクリックしあるいはドラッグアンドドロップすることで)、そのサービスにアクセスすることが可能となる。この場合も、画面表示ではネットワークの種別を問わず、第2のIEEE1394バス3に接続されたサービスも、ホームオートメーション網12に接続されたサービスも区別なく表示され

ている。

【0131】以上、1394バスのコンフィグレーションROMの読み込みによって、端末あるいはサービスを認識する方法であった。

【0132】次に、サービスロケーションプロトコルを利用したサービスの登録について説明する。

【0133】インターネットの標準化機関であるIETFでは、サービスロケーションプロトコルを用いたサービスの登録、検索方式を検討している。これらでは、IP端末を対象に、サービスをあらかじめいくつかに分類し、

(1) それらのサービス別にディレクトリエージェント(本実施形態においてはディレクトリサーバともいう)に、そのサービスを行うサーバの位置情報を登録する。ユーザは、このディレクトリエージェントに問い合わせをすることで、サービスの位置を知ることができるようになる。

【0134】(2) サービス別にIPマルチキャストアドレスを用意する。あるサービスを要求しているユーザは、そのIPマルチキャストアドレスに対して、「そのサービスはどこだ?」という意味のメッセージを飛ばす。そのサービスを提供しているサーバは、これに呼応することで、ユーザはそのサービスを提供しているサーバの位置を知ることができるようになる。

【0135】という2つの方法でサービス登録、検索ができるようになっていく。

【0136】本実施形態では、第2のAV接続装置5が、上記(1)のサービスロケーションプロトコルのディレクトリエージェントとなっている。

【0137】第2の家庭内ネットワーク上のIP端末(図1ではPC10とプリンタ11)は、その提供しているサービスをディレクトリエージェントである第2のAV接続装置5に登録する。まず、IP端末は、ネットワーク上のどこにディレクトリエージェントが存在しているかどうかを調査し、サービス情報を登録するための手順を踏む。これについて、PC10がサービスを登録する場合を例にして、図9を参照しながら説明する。

【0138】PC10は、サービスリクエストメッセージを第2のIEEE1394バス3に対して、送出する。サービスリクエストメッセージは「このサービスを提供しているサーバは返事をしてください」という意味のメッセージであり、本例の場合より具体的には「ディレクトリサービスを提供しているサーバは返事をしてください」という意味のメッセージを送出する。

【0139】サービスリクエストメッセージには対象とするサービス種別を特定するために「predicate」領域が設けられており、この領域に「ディレクトリサービス」と記述し、さらに宛先をディレクトリエージェント(DA)ディスカバリマルチキャストアドレス(IPアドレス)としてこのメッセージを送出する。

【0140】本実施形態においては、第2の家庭内ネットワークにおいて、IPパケットが到達するネットワークを第2のIEEE1394バス3のみとするため、PC10から送出されたサービスリクエストメッセージは、ディレクトリエージェントである第2のAV接続装置5とプリンタ11に到達する。

【0141】サービスリクエストメッセージを受け取ったディレクトリエージェントである第2のAV接続装置5は、自身がディレクトリエージェントであることを通知するために、「ディレクトリエージェント(DA)アドバタイズメント」をPC10に送り返す。なお、プリンタ11は、自身がディレクトリエージェントではないことから、サービスリクエストメッセージを無視する(通常はリンクレイヤが受け取らない)。

【0142】次に、PC10は、ディレクトリエージェント(DA)アドバタイズメントを受け取ることで、ディレクトリエージェントが第2のAV接続装置5に存在することを認識する。

【0143】次に、PC10は、自身が提供しているサービスのディレクトリエージェントへの登録を行う。本実施形態では、PC10は、自身がWWWサービス(具体的にhttpサーバ)とデジタルアルバムサービスを提供するとともに、さらにホームオートメーション網12につながるエアコン13と電子レンジ14のサービスについても代理サーバとして外部からのサービス要求を受けられるようになっている。

【0144】サービス登録にあたってPC10は、PC10自身が提供しているWWWサービスとデジタルアルバムサービスのそれぞれについて、その位置情報や属性情報等を登録するとともに、ホームオートメーション網(LON)12上のサービスそれぞれについても、エアコン13と電子レンジ14に代わってその位置情報や属性情報等の登録を行う。

【0145】図10の(a)、(b)にそれぞれWWWサービス、デジタルアルバムサービスの登録情報の内容の一例を示す。WWWサービス、デジタルアルバムサービスの位置情報としてPC10のIPアドレスと各サービス毎に定められたポート番号を含むURLが用いられている。

【0146】また、図10の(c)、(d)にそれぞれPC10が代理するエアコンサービス、電子レンジサービスの登録情報の内容の一例を示す。この場合、各代理サービス用にPC10のポート番号を割当てて、図10の例ではLON上のエアコンサービスには15000を、LON上の電子レンジサービスには15001を割当てている。これによって、外部の端末は、PC10上にエアコンサービスと電子レンジサービスが存在すると解釈するとともに、しかも、それらサービスはIPレベルでのサービスであると解釈する。

【0147】外部の端末が、ホームオートメーション網

12のエアコンサービスにアクセスしたいときはPC10のポート番号15000にアクセスし、電子レンジサービスにアクセスしたいときはPC10のポート番号15001にアクセスする。一方、PC10は、ポート番号15000にアクセスされた場合にはエアコン向けのサービス要求であると解釈し、またポート番号15001にアクセスされた場合には電子レンジ向けのサービス要求であると解釈し、渡されたIPの制御コマンドをLONの制御コマンドに翻訳し、これをホームオートメーション網12上の実際の機器（エアコン13または電子レンジ14）に向けて送出する。この操作についてはエアコンサービスへのアクセスを例にとって後述する。

【0148】このように図9のサービス登録によって、第2のAV接続装置5に、WWWサービス、デジタルアルバムサービス、LON上のエアコンサービス、LON上の電子レンジサービスが登録されることになる。サービス登録が成功すると、ディレクトリエージェントである第2のAV接続装置5はサービスアクノリッジ（ACK）をPC10に向けて返送する。

【0149】なお、同様にしてプリンタ11から第2のAV接続装置5に対してプリンタサービスの登録が行われる。

【0150】以上のように、サービスロケーションプロトコルの登録の手続きにより、WWW、デジタルアルバム、エアコン、電子レンジ、プリンタの各サービスがディレクトリエージェントである第2のAV接続装置5に登録されることになる。

【0151】さて、この登録手順により得られる情報と、先説明したIEEE1394上のコンフィグレーションROMの読み込みにより得られる情報と合わせて、第2の家庭内ネットワーク上のサービス情報を構成することが可能である。

【0152】その構成方法はさまざまな種類が考えられるが、本実施形態では、その一例として、(i) サービスロケーションプロトコルにて登録されたサービスについては、これを優先的に表示し、(ii) ここに現れないサービス、具体的には、サービスロケーションプロトコルでは認識されないノードであって、かつ、IEEE1394上のコンフィグレーションROMの読み込みでは認識されたノードについては、コンフィグレーションROMの情報に基づいてサービス情報を構成し、(i)と(ii)の両者の情報を併せて、一つの「第2の家庭内ネットワーク上のサービスディレクトリ情報」としてユーザおよび外部に紹介するという方法である。

【0153】より具体的には、サービスロケーションプロトコルの登録の手続きにより認識された、WWWサービス、デジタルアルバムサービス、エアコンサービス、電子レンジサービス、プリンタサービスと、IEEE1394上のコンフィグレーションROMの読み込みにより認識されたDVDプレーヤサービスと、ビデオサー

スを合わせて、全サービスが認識される。そして、例えば図7のように第2のAV接続装置5のコンソール上に、第2の家庭内ネットワーク上に展開されているサービス別に1つずつアイコン(i21~i27)が表示される。また、前述と同様にユーザは所定のユーザインタフェースにより使用したいサービスを指示することで（例えばマウス装置を用いてクリックしあるいはドラッグアンドドロップすることで）、そのサービスにアクセスすることが可能となる。

【0154】ところで、サービスの提供を受けるユーザ端末であるユーザエージェントは、自身が接続されているIEEE1394バス上のサービスに関する情報をディレクトリエージェントに問い合わせて入手することもできるが、その代わりに前述したディレクトリエージェントへのサービスに関する情報の登録手順と同様の手順により、自身が各装置からの通知を受けることで、サービスに関する情報を入手することもできる。

【0155】次に、第1の家庭内ネットワークのユーザ（つまり1394バス1に接続された端末のユーザ）が、公衆網2を介して、第2の家庭内ネットワーク内の端末（つまり1394バス3またはホームオートメーション網12に接続された端末）を遠隔操作して所望の動作をさせる場合について説明する。

【0156】図1に示されるように、第1の家庭内ネットワークと、第2の家庭内ネットワークとは、公衆網2で相互接続されている。前述したように公衆網2は、電話網でもよいし、広い帯域の回線、あるいは専用線のようなものであってもよいし、インターネットであってもよい。また、IPアドレスにはプライベートIPアドレス（公衆網2がインターネットではなくISDN等である場合）またはグローバルIPアドレス（公衆網2がインターネットである場合）を使用するものとする。

【0157】ここで、第1のAV接続装置4は、第1の家庭内ネットワークのディレクトリエージェントであり、先に第2のAV接続装置5について説明したものと同様の手順によりネットワーク内のサービスを認識しているものとする。より具体的には、端末としてはPC6とデジタルTV7が認識され、サービスとしてはPC6により提供されるなんらかのサービスとデジタルTVサービスが認識される。

【0158】さて、最初のフェイズとして、第1の家庭内ネットワークのユーザに対して、第2の家庭内ネットワーク内のサービスを提示するために、第1のAV接続装置4は、第2の家庭内ネットワークのサービス情報（ディレクトリ情報）を収集することを試みる。その際、第1の家庭内ネットワークと第2の家庭内ネットワークとは、インターネットプロトコルにて通信を行うものとする。なお、本実施形態の手法は別のプロトコル、例えばIPXやNetBEUI等を用いた場合も同様に適用可能である。

【0159】図12に、サービス情報の収集のために第1のAV接続装置4と第2のAV接続装置5との間で行われる情報交換の手順の一例を示す。

【0160】まず、第1のAV接続装置4は、第2の家庭内ネットワーク内のディレクトリエージェントを検索するため、第2の家庭内ネットワークに向けて、「predicate」をディレクトリエージェントとしたサービスリクエストを送出する。これを実現するためには、例えば、ホップ数を複数にして（スコープが他の家庭内ネットワークも含むようにして）IPマルチキャストを10 送付する方法や、第2の家庭内ネットワークに対してソースルーチングあるいはルーチングヘッダを付けた上で、上記IPマルチキャストアドレスに送付する方法などが考えられる。

【0161】ここで、相手側の家のIPアドレス、特にIPサブネットアドレス（すなわちネットワークのアドレス）を知る方法としては、例えば、相手側の家に対して、ルーチングプロトコルによってルーチング情報を交換して、相手側のアドレスを知る方法などが考えられ

る。

【0162】さて、このサービスリクエストを受信した第2の家庭内ネットワークのディレクトリエージェントである第2のAV接続装置5は、自身がディレクトリエージェントである旨を伝えるためにディレクトリエージェントアダプタイズメントを第1のAV接続装置4に伝える。

【0163】次に、第1のAV接続装置4は、第2の家庭内ネットワークでどのようなサービスが提供されているかを知るために、サービスタイプリクエストを第2のAV接続装置5に送付する。

【0164】第2のAV接続装置5は、サービスタイプリプライとして、WWW（URLで表記されたサービス名はhttp）、デジタルアルバム（同album）、プリンタ（同lpr）の他に、LONに接続されたエアコン（同aircon\_lon）、LONに接続された電子レンジ（同microwave\_lon）、1394 端末であるDVDプレーヤ（同DVD1394）、1394 端末であるデジタルVTR（同DVTR1394）が通知される。例えば図12に示すように、「Service:http://」、「Service:album://」、「Service:lpr://」、「Service:aircon\_lon://」、「Service:microwave\_lon://」、「Service:DVD1394://」、「Service:DVTR1394://」が通知される。

【0165】LONに接続された機器については、PC10から通知されたサービス情報（サービスのロケーションを表すURL情報）を、そのまま第1のAV接続装置4に通知している。すなわち、IPのサービスロケー

ションプロトコルで登録されたサービスについては、そのまま第1のAV接続装置4に通知している。

【0166】第2の家庭内ネットワークのディレクトリエージェントである第2のAV接続装置5が1394 端末/サービスとしてしか認識できなかったサービスについては、ディレクトリエージェントである第2のAV接続装置5自身がそのサービスの代理サーバとしてサービスを提供することを試みるために、「1394上のDVD」、「1394上のDVTR」という意味で、「service:DVD1394」、「service:DVTR1394」という新しいサービスカテゴリを用いてIP上で第1のAV接続装置4に紹介している。

【0167】次に、これら情報を受け取った第1のAV接続装置4は、受け取ったそれぞれのサービスについての詳細情報を収集するための手順に入る。

【0168】その収集方法の一例を以下に示す。すなわち、上記サービスタイプリプライで受信した全サービスについて、あるいはそのうち第1のAV接続装置4側にとって興味のあるサービスについて、そのロケーションと属性情報を得るために、それぞれサービスリクエストおよび属性リクエストをディレクトリエージェントである第2のAV接続装置5に送付する。サービスリクエストに対しては、サービスリプライ（具体的には、そのサービスのロケーション情報であるURL；例えば、URL: Service:DVD1394://192.168.1.254:20000）が返答され、属性リクエストに対しては、属性リプライ（そのサービスの属性情報；例えば、1394上のDVDの属性情報）が返答される。なお、詳細についてはサービスロケーションプロトコルのドキュメント（例えばインターネット10 ドラフトのdraft-ietf-svrloc-protocol-16.txtなど）に記述されている。

【0169】図12にはDVD1394サービスについての上記手続きについて記述してあるが、その外の全てのサービスについても同様にして情報を収集すると、第1のAV接続装置4は、第2の家庭内ネットワークのサービス情報を図13のように収集できる。

【0170】ここで、DVD1394、DVTR1394のそれぞれのサービスについては、先にも述べたように、第2のAV接続装置5がこれらのサービスの代理サーバとして、外部からのサービス要求を受けられるようになっている。すなわち、具体的なサービスの具現である、IPのプロトコルである遠隔コマンドプロトコル等を、1394ノードに代わって第2のAV接続装置5が受け、これを1394ノードと1394プロトコルに変換してやり取りする（なお、その詳細については後述する）。このようにすることにより、本来1394プロトコルでしかやり取りのできないサービス（ここではDVDサービスとDVTRサービス）について、ネットワークを問わないプロトコルであるIPのサービス紹介プロ



トコルを通して紹介することができるため、ネットワークを問わず、任意のIPノードから、上記1394ノードへのコマンドの送付、制御が可能となる（可制御となる）。

【0171】各種リプライで収集された情報のうち第2のAV接続装置5が代理で受付けるサービス（DVDサービスとDVTRサービス）については、そのサービス窓口となるポート番号、すなわち各代理サービス用のポート番号を割当ててようにする。このポート番号は、あらかじめ標準化機関などによって割当てがなされたものであってもよいし、ノード同士のネゴシエーションにより決められたものであってもよい。本実施形態の場合は、1394上のDVDサービスについては20000、1394上のDVTRサービスについては20001とする。これによって、外部の端末（例えば第1の家庭内ネットワーク上の端末）は、第2の家庭内ネットワーク上に上記サービスが存在すると解釈するとともに、しかも、それはIPレベルでのサービスであると解釈する。

【0172】さて、第1の家庭内ネットワーク上の端末、例えば第1のAV接続装置4は、例えば図14のように、そのコンソール上に、自身が認識しているサービスの一覧表示という形で、第1の家庭内ネットワークについての情報に加えて、第2の家庭内ネットワーク（例えば〇〇さん宅の家庭内ネットワーク）上のサービスの情報についても、前記サービスロケーションで取得した情報に基づいて表示する。この表示の仕方は図11のものと同一の方針によるものであってもよい。

【0173】次に、外部の端末が第2の家庭内LANの各種サービスにアクセスしたいときは、図13のURLで紹介されているアドレスとポート番号にそれぞれアクセスする。

【0174】例えば、ユーザが第1のAV接続装置4を操作して、第2の家庭内LAN上の1394端末であるDVDプレーヤ8から映像を公衆網2を介して持ってきて、これをデジタルTV107に映し出す場合を考える。

【0175】ユーザの実際の操作は例えば次のようになる。ユーザはまず図14のDVDプレーヤのアイコンをクリックする。すると例えば図15のようなDVDプレーヤ操作のための操作ボタン群が画面に表示される。次にユーザは所望の操作ボタンをクリックするなどしてDVDプレーヤ8の遠隔操作を行う。また、受信端末がデジタルTVであるをクリック等、なんらかの入力方法で指定する。

【0176】図16に、このときに実際のネットワーク上を流れるコマンド群、プロトコル群についてのシーケンスの一例を示す。

【0177】まず、第1のAV接続装置4は、デジタルTV7に映像を流し込んで、これを表示させるための設定を行うべく、以下のようなシーケンスの動作を行う。

すなわち、IEC1883プロトコルにしたがって、第1のIEEE1394バス上の同期チャネルを確保する。このとき、取得した同期チャネルの同期チャネル番号は#yであるとする。

【0178】次に、第1のAV接続装置4は、デジタルTV7の電源をオンにし、同期チャネル#yからの映像を画面に映し出すための、あらかじめ1394TA等の標準化団体で定められた制御コマンド（例えば1394AV/Cプロトコル）を使って、コマンドを送付する。コマンドが受け付けられたなら、ACKを第1のAV制御装置4に返すようにしてもよい。これにより、第1のAV接続装置4からデジタルTV7までの回線が確保されたことになる。

【0179】これと相前後してまたは並行的に、第1のAV接続装置4は、第2のAV制御装置5に対して、DVDプレーヤ8に対するコマンドを発行する。ここで、第1のAV接続装置4は、DVDプレーヤ8はIPサービスであると解釈している。コマンドは、第2のAV接続装置5（IPアドレス=192.168.1.254）の代理サーバのポート、すなわち20000に対して発行される。

【0180】ここで、遠隔操作のためのコマンドとしては、例えばRTSP（Real Time Streaming Protocol）を利用する。RTSPは、遠隔のリアルタイム信号の制御を行うためのプロトコルであり、インターネットの標準化機関であるIETFで議論が行われている。詳細については例えばインターネットドラフトdraft-ietf-mmmusic-rtsp-02.psに開示されている。

【0181】第1のAV接続装置4は、DVDプレーヤ8を再生させるために必要なコマンド（例えばSETUPコマンドや、PLAYコマンド）をRTSP上で発行する。

【0182】RTSPのSETUPコマンドを受信した第2のAV接続装置5は、今後DVDプレーヤ8に対する制御が開始されると解釈し、DVDプレーヤ8が接続されている第2のIEEE1394バス3上に映像伝送のための帯域、すなわち同期チャネルの確保を行う。これは、IEC1883により行われる。ここで、確保された同期チャネル番号を#yとする。帯域は、経験的な値（例えばMPEGなら6Mbps等）を用いることとしてもよいし、メッセージ中に要求値を含めてもよい。

【0183】また、RTSPのPLAYコマンドを受信した第2のAV接続装置5は、これを1394コマンド、すなわち1394AV/Cプロトコル等、1394端末間のプロトコルとして規定された、対応するコマンド（例えばDVD-PLAYというコマンドが規定するものとする）により、コマンドをDVDプレーヤ8に発行する。

【0184】このようなコマンドの変換は、1394/

IPコマンド変換機能29にて行われる。その処理の流れを図17を参照しながら説明する。IP上のコマンドはサービスロケーション代理機能27により受信される。受信されたコマンドは1394/IPコマンド変換機能29によりコマンド変換される。具体的には、DVD用のコマンド対応テーブル61、DVTR用のコマンド対応テーブル62といったように、IP上のコマンド（あるいは操作）と1394上のコマンド（あるいは操作）との関係を記述したテーブルをサービス別に設け、これらサービス別テーブルをもとにIPで送付されてきたコマンドを1394のコマンドに変換し、これを1394AVコマンド処理機能28に渡し送出を指示する。そして、指示を受けた1394AVコマンド処理機能28により実際のコマンドの送出が行われる。

【0185】なお、上記とは逆の方向にコマンドが流れる場合、すなわち1394コマンドが入力されこれをIPコマンドに変換して出力する場合も、手順は同じ様になる。すなわち、1394コマンドは1394AVコマンド処理機能28により受信され、これが1394/IPコマンド変換機能29においてサービス別テーブルをもとにIPコマンドに変換され、これがサービスロケーション代理機能27により送出される。

【0186】さて、このようにしてコマンドがDVDプレーヤ8に到達すると、実際の映像データの送信が第2の1394バス3の同期チャンネル#xを通して行われる。これは、ACK信号が返った後（なお、ACK信号は公衆網（ISDNあるいはインターネット等）上ではRTSPのOKに変換されてもよい）、実際のデータ転送が開始される。

【0187】第2のAV接続装置5は、データリンクスイッチ22を介して、映像データを公衆網2に送出する。その際、MPEG多重の形でこれを送付してもよい。

【0188】送出された映像データは公衆網2を介して第1のAV接続装置4に送付される。第1のAV接続装置4は、受信した映像データをデータリンクスイッチ22を介して、第1の1394バス1の同期チャンネル#yに送付し、最終的に映像データはデジタルTV7にて再生される。この結果、第1の家庭内LANのユーザはデジタルTV7にて、第2の家庭内LAN上のDVDプレーヤ8からの映像を見ることができるようになる。

【0189】なお、前述したように、映像データの伝送経路のデータリンクレイヤでの帯域や仮想伝送路識別子の確保、整合を、FANP処理機能25あるいはその他のRSVP処理機能等により実現するのが好ましい。FANP等を用いることにより、ネットワーク種別を問わない、通信資源の確保が可能となる。そのようにした場合のシーケンスの一例を図18に示す。図18では、実際の映像データの送付に先立ち、FANPにより、映像データの経路となるデータリンクの通信資源の確保と、

識別子の整合、接続装置の設定等が行われている。

【0190】次に、公衆網2を介した遠隔操作の他の例として、例えば第1の家庭内LANのユーザが、第1のAV接続装置4を操作して、第2の家庭内LAN上のエアコン13（LON端末である）を操作することを考える。

【0191】ユーザの実際の操作は例えば次のようになる。ユーザはまず図14のエアコンのアイコンをクリックする。すると例えばエアコン操作のための操作ボタン群が画面に表示される。次にユーザは所望の操作ボタンをクリックするなどしてエアコン13の遠隔操作を行う。

【0192】図19に、このときに実際のネットワーク上を流れるコマンド群、プロトコル群についてシーケンスの一例を示す。

【0193】まず、第1のAV接続装置4は、サービスロケーションで示されている、代理サーバのPC10に対して、エアコン13に対するコマンドを発行する。ここで、第1のAV接続装置4は、エアコン13はPC10が提供しているIPサービスであると解釈している。コマンドは、代理サーバであるPC10のポート、すなわち15000に対して発行される。

【0194】ここで、遠隔操作のためのコマンドとしては、CCCP（Cam Coder Control Protocol）を利用することができる。CCCPは、遠隔のカムコーダの制御をインターネットを介して行うためのプロトコルであるが、同様の考え方で様々な電気機器の制御が可能であり、特にエアコン向けのコマンド群がCCCPに存在するものとする。なお、CCCPの詳細は例えばインターネットドラフトdraft-oh-ta-ccc-video-00.txtに開示されている。

【0195】第1のAV接続装置4は、エアコン13の電源をオンにするのに必要なコマンド（POEWR\_ONコマンド）をCCCP上で発行する。

【0196】CCCPのPOWER\_ONコマンドを受信したPC10は、これをLONコマンド、LONノード間のプロトコルとして規定された、対応するコマンド（例えばLON\_POWER\_ONというコマンドが規定するものとする）により、コマンドをエアコン13に発行する。

【0197】このようなコマンドの変換は、PC10内にて行われる。その処理の流れを図20を参照しながら説明する。IP上のコマンドは、サービス代理受信機能71が受信する。受信されたコマンドはCCCP/LONコマンド変換機能72によりコマンド変換される。具体的には、CCCP/LONコマンド変換機能72にLON用のコマンド対応テーブル、すなわちIP上のコマンド（あるいは操作）とLON上のコマンド（あるいは操作）との関係を記述したテーブルを設け、このテーブ

ルをもとにCCCPで送付されてきたコマンドからLONを介してエアコン13に対して送付すべきコマンドに変換し、これをLONコマンド発行機能73に渡し送出を指示する。そして、指示を受けたONコマンド発行機能73により実際のコマンドの送出が行われる。

【0198】上記とは逆の方向にコマンドが流れる場合、すなわちLONコマンドが入力されこれをCCCPコマンドに変換して出力する場合も、手順は同じ様になる。

【0199】なお、ACK信号が返る場合は（なお、ACK信号は公衆網（ISDNあるいはインターネット等）上ではCCCPのOKに変換されてもよい；図19中ではOKとして示してある）、これも第1のAV接続装置4に通知される。

【0200】なお、本実施形態で説明したメカニズムは、家庭内ネットワークに限らず、一般の企業ネットワーク、特にいわゆる「モバイル環境」を実現するためのネットワーク技術に適用することが可能であることは、言うまでもない。

【0201】また、本実施形態では、ネットワークレイヤの protocols としてIP、データリンクレイヤの protocols としてIEEE1394とLONを用いて説明したが、ネットワークレイヤの protocols として、DAVICで標準化を進めているDSM-CCや、IPX等、データリンクレイヤの protocols として、イーサネットやATM等の技術を用いることも可能である。

【0202】ところで、上記した実施形態では、AV接続装置にサービスロケーションサービスの機能およびコマンド変換の機能を設け、AV接続装置がサービスを提供したが、これらの機能は、本実施形態のAV接続装置すなわちネットワークの相互接続を行っているノードが行う必要はなく、例えば図1におけるPC6あるいはPC10に設け、それらがサービスを提供するようにしても良い。

【0203】この場合、図2のAV接続装置がサービスを実現していた場合と同様に、ネットワークI/F（図2の1394I/F21に相当）、IP処理機能24、1394/IPサービスロケーション処理機能26、サービスロケーション代理機能27、1394AVコマンド処理機能28、1394/IPコマンド変換機能29を、PC6あるいはPC10あるいはその他のノードに実装し、さらにネットワークの通信資源を確保させる制御や、ネットワーク間で用いる識別子を整合させる制御等のネットワーク制御が必要な場合は、FANP処理機能25あるいはRSVPによる制御処理機能等を実装すれば良い。

【0204】また、サービスロケーションサービスの機能とコマンド変換の機能とを、互いに異なるに実装することも可能である。

【0205】なお、以上の説明では、公衆網2がインタ

ーネットではなくISDN等である場合に端末のIPアドレスにはプライベートIPアドレスを用い、あるいは公衆網2がインターネットである場合に端末のIPアドレスにはグローバルIPアドレスを用いるものとしたが、例えばNAT（Network Address Translation）等のアドレス変換を用いて、公衆網2がインターネットである場合に少なくともネットワークの相互接続を行うノード（図1ではAV接続装置端末）にグローバルIPアドレスを用い、その他のノードにはプライベートIPアドレスを用いることができるようにしてもよい。この場合、例えば、外部のネットワークからは、ネットワークの相互接続を行うノードのグローバルIPアドレスと、宛先となるノードのプライベートIPアドレス（またはプライベートIPアドレスとポート番号の組）を指し示すためのポート番号との組を宛先として、IPパケットを転送し、ネットワークの相互接続を行うノードにて、テーブルを参照するなどして、当該グローバルIPアドレスとポート番号の組を、宛先となるノードのプライベートIPアドレス（またはプライベートIPアドレスとポート番号の組）に変換するようにしてよい。

【0206】（第2の実施形態）本実施形態ではIEEE1394インタフェースを持つPCが同一の1394バスに接続された1394装置を認識して利用する場合について説明する。

【0207】一般に、1394バスには種々の装置が接続される可能性があり、PCは予め接続されるすべての装置に関する情報やそれを制御するためのドライバソフトウェアを持っているわけではない。

【0208】そこで、本実施形態では、1394バスに接続された装置の情報の収集を行う。その手順の概略は次の通りである。

【0209】i) まず、1394 unit の認識を行う。具体的には1394ノードのunique IDとunit番号を取得する。

【0210】ii) 次に、各unitのカテゴリ判別を行う。そして、登録済みの論理デバイスに対応するカテゴリか否かを判断する。

【0211】iii) 次に、登録済みデバイスについて、占有状態の取得を行う（なお、この場合には、標準ドライバを利用する）。

【0212】iv) そして、登録済みでない1394 unitの占有状態の判定を行う。

【0213】また、本実施形態では、非同期的に発生してデバイスドライバの構成の変更を行う事象として次のものを扱う。

【0214】i) アプリケーションによる装置の利用要求

ii) IEEE1394インタフェースのバスリセット（1394装置の追加、削除）

iii) 装置の占有状態の変更

以下、本実施形態について詳しく説明する。

【0215】まず、ハードウェア構成について説明する。

【0216】図21に本実施形態に係るPCの構成例を示す。81はPCを、82はプロセッサを、83はプロセッサのローカルバスに接続されたメインメモリを、84はシステムバスを、85は2次記憶装置を、86、87はIEEE1394インタフェースを、88はハードディスクをそれぞれ表す。

【0217】2次記憶装置85とIEEE1394インタフェース86とIEEE1394インタフェース87は、それぞれシステムバス84に接続されている。2次記憶装置85は、例えばフラッシュEEPROMによって構成される。

【0218】ハードディスク88は、PC81の筐体内部にあるIEEE1394インタフェース87によって接続されている。

【0219】IEEE1394インタフェース86は、PC81の筐体外に置かれているプリンタ90、FAX91、マッサージ装置（リクライニングシート型マッサージ装置とする；以下、単に、マッサージ装置と呼ぶ）92、トースタ93にそれぞれ接続している。なお、説明上、FAX91はFAX機能およびスキャナ機能に対応するユニットとプリンタ機能に対応するユニットを持ち、マッサージ装置92は背中、首等の上半身部分へのマッサージ機構に対応するユニットと足等の下半身部分へのマッサージ機構に対応するユニットを持つものとする。

【0220】次に、オペレーティングシステム（以下、OS）のソフトウェア構造について説明する。

【0221】図22に本実施形態のPC81におけるソフトウェア構造の一例を示す。

【0222】図22のOS内部において、101はOSの論理デバイス管理機能、102は2次記憶装置管理機能、103は1394インタフェース管理機能をそれぞれ表す。

【0223】2次記憶装置102、ハードディスク103はOSが直接管理する。一方、プリンタ90、FAX91、マッサージ装置92、トースタ93の各ハードウェアについては1394管理機能を通じてデバイスの認識や登録が行われる（この手順については後述する）。

【0224】111、112は、2次記憶装置管理機能102の配下であり、2次記憶装置85とハードディスク88をそれぞれ制御するデバイスドライバである。113、114はそれぞれ1394インタフェース管理機能103の配下であり、IEEE1394インタフェース86、87をそれぞれ制御するデバイスドライバである。

【0225】図22のOS API (Applicat

ion Programing Interface) とJAVA APIの間において、121は1394管理オブジェクトを表す。

【0226】図22のJAVA SPI (System Programing Interface) とJAVA APIの間において、122は論理デバイス管理オブジェクトを表し、131、132、133、134はそれぞれモデム、プリンタ、スキャナ、不明に対応する論理デバイスクラスオブジェクトを表し、131-1~2、132-1、133-1、134-1~3はそれぞれ131、132、133、134の論理デバイスクラスオブジェクトによって管理される論理デバイスオブジェクトを表す（不明のクラスの詳細については後述する）。

【0227】図22のOS APIとJAVA SPIの間において、151はプリンタ90のunit1（図22中104）に、152はFAX91のunit1（図22中105）に、153はFAX91のunit2（図22中106）に、154はマッサージ装置92のunit1（図22中107）に、155はマッサージ装置92のunit2（図22中108）に、156はトースタ93のunit1（図22中109）にそれぞれ対応する物理デバイスオブジェクトを表す。また、161、162、163、164、165、166はそれぞれ151~156の物理デバイスオブジェクトに対応するドライバオブジェクトを表す。

【0228】図22中において、矢印は各々のオブジェクトの参照関係を表す。参照関係を持つことにより、参照先のオブジェクトのメソッドを起動して状態変数を読み出すことができる。例えば、物理デバイスオブジェクト151~156は、1394管理オブジェクト121に始まる参照関係を持つことによって、1349管理オブジェクトの配下にある物理デバイスオブジェクトとして登録されていることを表している。151はプリンタクラスの論理デバイスオブジェクト131-2に登録されており、ドライバオブジェクト161は物理デバイスオブジェクト151に登録されており、他のものも同様である。

【0229】次に、OSの初期化について説明する。

【0230】PC81は、電源投入後、2次記憶装置85に格納されたプログラムを読み込みOSを起動する。OSの一般仕様については特に問わないが、OS上ではコンパイルされたJavaコードが実行できるものとする。なお、Javaについては種々の文献があるが例えばJava Language Specification <http://java.sun.com>にて詳しく説明されている。

【0231】本実施形態では、IEEE1394インタフェース87に接続されるハードディスク88はOSで直接管理する1394装置として予め決められている。

IEEE1394機器はレジスタへの値の書き込みや読み出しによって操作するものであり、PC81はハードディスク87の予め定められたレジスタにPC81自身のIEEE1394インタフェースのunique IDを書き込むことにより、ハードディスク88をIEEE1394インタフェース87を持つPC81が排他的に使用することを示す。

【0232】PC81のOSはJavaプログラムからIEEE1394インタフェースのトランザクション要求の発行および応答ができるAPI (Application Programming Interface) を持つ。PC81の初期化によるOSの起動後、上記APIを通じて各々の1394インタフェースに接続されているIEEE1394機器を管理するJavaコードが実行される。これを1394管理オブジェクトと呼ぶ。また、OSは、オブジェクトクラスの名前から対応するコードの識別子を得てオブジェクトを生成する動的オブジェクトローディング機構を備えているものとする。

【0233】以下では、Javaコードの格納、伝送形態をxxコード、あるクラス全体に関わるオブジェクトをxxクラスオブジェクト、あるクラスの実体化されたオブジェクトをxxオブジェクトと呼ぶ。例えば、ある型の論理装置全てを管理するオブジェクトを論理デバイスクラスオブジェクト、各々の物理装置に対応する装置のJava APIを提供するオブジェクトを論理デバイスオブジェクトと呼ぶ。また、オブジェクトのコードにはある識別子が付与されていて、それを他のオブジェクトと識別することができるものとする。識別名はオブジェクトコードに埋め込まれていても良いし、それを格納するファイル名あるいはそれが格納されているISO1212形式のアドレスで表現されても良い。一方、オブジェクトには少なくとも当該PCで一意に他のオブジェクトと識別できる識別子が付与されているものとする。例えばオブジェクトが格納される仮想記憶空間のアドレスである。IEEE1394バスで使用する際には識別子はIEEE1394バス上で一意に識別されることが望ましい。

【0234】次に、物理装置の認識について説明する。

【0235】OSによる1394インタフェースの初期化が完了すると、1394管理オブジェクト121と論理デバイス管理オブジェクト122が生成される。1394管理オブジェクト121と論理デバイス管理オブジェクト122は互いの参照を保持し、相互に情報を交換しながらデバイスの認識と登録を行う。

【0236】1394管理オブジェクト121はIEEE1394インタフェース86、87に接続されている装置の情報を収集して各1394ノードを認識する。ただし、1394管理オブジェクト121の初期化時に予めOSが排他的に利用するものと定義されたハードディ

スク87は認識から除外される。1394管理オブジェクト121は前述の1394制御APIを通じてPC81の各1394インタフェースの持つTOPOLOGY\_MAPレジスタまたはSPEED\_MAPレジスタにあるnode ID毎に各ノードにconfigROM領域の読み出し要求を発行して当該ノードのunique IDとunitが複数存在すればそれぞれのunit IDおよびcapabilityを得る。これらレジスタの形式はIEC 1212 (ANSI/IEEE Std 1212 Control and Status Register (CSR) Architecture for Microcomputer Buses [ISO/IEC 13213]) で定められており、詳細についてはここでは省略する。

【0237】最終的に1394管理オブジェクト121はunique IDとunit IDとcapabilityの組のリストを得てこれらデバイスの登録を行う。1394管理オブジェクト121はプリンタ90、FAX91、マッサージ装置92、トースタ93から上記レジスタの値を読み出してそれぞれのunitに対応する1394物理装置オブジェクト151~156を生成する。FAX92、マッサージ装置93は2つのunitを持っており、それぞれ対応する物理デバイスオブジェクト152、153、154、155を生成する。オブジェクトの生成が完了すると1394管理オブジェクト121は論理デバイス管理オブジェクト122に物理デバイス登録の完了を通知する。

【0238】認識の対象から外される装置は、予めOSによって占有されている装置の他に、装置自身のレジスタが占有を表していて、そこに占有を示す値が書き込まれている場合には認識の対象とはしないこととしても良い。

【0239】ここで、登録について説明する前に、デバイスを制御するプログラム（ここではオブジェクトと呼ぶ）の構造と動作について説明する。

【0240】各々の装置の機能に対応し、アプリケーションに入出力APIを提供するのが131-1、132-1、…の論理デバイスオブジェクトである。それぞれの論理デバイスオブジェクトは、ファイル、プリンタといった種別毎に設けられる論理デバイスクラスオブジェクトによって管理される。各々の論理デバイスオブジェクトはただ一つの論理デバイスクラスオブジェクトに帰属するが、一つの論理デバイスクラスオブジェクトは配下に複数の論理デバイスオブジェクトを持っても良い。例えば、プリンタの論理デバイスオブジェクト131-1は、ただ一つの論理デバイスクラスオブジェクト131に帰属するが、プリンタの論理デバイスクラスオブジェクト131の配下には、131-1、131-2の2つの論理デバイスオブジェクトがある。

【0241】物理デバイスオブジェクトは、1394コ

ニットと1対1対応に存在する。1つの物理デバイスオブジェクトが複数の論理デバイスオブジェクトから参照されることもある。例えば、物理デバイスオブジェクト152は、プリンタ91のunit1に対応しているとともに、プリンタの論理デバイスオブジェクト131-1とFAXの論理デバイスオブジェクト133-1の2つの論理デバイスオブジェクトから参照されている。

【0242】本実施形態では、PC81は、プリンタ、スキャナ、FAX、不明の各デバイスクラスに対応する論理デバイスクラスオブジェクト131~134を持つて10 いるものとする。各々の論理デバイスクラスオブジェクトは、その配下に論理デバイスオブジェクト131-1...n, 132-1...n, 133-1...n, 134-1...nを持っている。PC81で実行されるJavaアプリケーションはこれら論理デバイスオブジェクトを通じて物理装置の実装の差異に関らず同一のクラスに属する物理装置は同一の方法で利用することができる。これはそれぞれの論理デバイスクラスオブジェクト毎にJava SPIが共通化されているからである。

【0243】例えば、プリンタ装置のアクセスを行う際のIEEE1394レジスタのアドレスと手順は、ANSI X3T10 Serial Bus Protocol (SBP)として定められている。IEEE1394インタフェースがどのような実装であっても上記SBPに則ったIEEE1394形式のメッセージをデバイスドライバが生成すればプリンタの制御を行うことができる。さらに、デバイスドライバがハードウェアやOSに依存しないJavaで記述されていれば、IEEE1394インタフェースのドライバへのシステムプログラムインタフェースが同一である限り、どのようなOS 30 においても同一のプリンタデバイスドライバが使用可能である。

【0244】アプリケーションは、論理デバイス管理オブジェクト122にデバイスクラス一覧を要求することによって、論理デバイスクラスオブジェクト131~134の一覧を得ることができる。論理デバイスクラスオブジェクトからは、それぞれのプリンタ、スキャナといった同じタイプに属する論理デバイスオブジェクトの一覧を得ることができる。論理デバイス管理オブジェクト122は、論理デバイスクラスオブジェクトの登録/削除などの管理も行う。

【0245】次に、論理デバイス管理オブジェクト122による論理デバイスクラスオブジェクトの初期化について説明する。図23に論理デバイス管理オブジェクト初期化手順の一例を示す。

【0246】論理デバイス管理オブジェクト122は、予め定められたデバイスクラス、プリンタ、スキャナ、FAXに対応する論理デバイスクラスオブジェクト131, 132, 133を生成し、図2中にて矢印で示されるこれらオブジェクト間の参照を作る(ステップS11 50

~S14)。

【0247】これら131, 132, 133の各論理デバイスクラスオブジェクトは、生成に続いて初期化を行う(その間、論理デバイス管理オブジェクト122は初期化完了を待つ;ステップS15)。初期化が完了すると論理デバイス管理オブジェクト122へ初期化が完了したことを通知する。

【0248】完了通知を受けた論理デバイス管理オブジェクト122は、最後に131~133の各論理デバイスクラスオブジェクトによって認識されなかった物理デバイスを管理する不明の論理デバイスクラスオブジェクト134を生成し、初期化する(ステップS16, S17)。論理デバイス管理オブジェクト122は、不明のクラスの初期化の完了通知を受けると、初期化完了状態となる(ステップS18)。

【0249】次に、論理デバイスクラスオブジェクトの初期化について論理デバイスクラスオブジェクト131を例に取りつつ説明する。図24に論理デバイスクラスオブジェクト初期化手順の一例を示す。

【0250】論理デバイス管理オブジェクト122は、論理デバイスクラスオブジェクトの生成時に1394管理オブジェクト121への参照を渡す。論理デバイスクラスオブジェクト131は、1394管理オブジェクト121に物理デバイスオブジェクトへの参照を要求する(ステップS21)。

【0251】1394管理オブジェクト121は、物理デバイスオブジェクトの参照が要求されると、自オブジェクトが保持している参照に従って物理デバイスオブジェクト151から順番に参照を返却する。

【0252】論理デバイスクラスオブジェクト131は、物理デバイスオブジェクト151への参照を入手すると、オブジェクト151の属性値取得メソッドを起動してunique ID、unit ID、capabilityを取得する(ステップS22)。論理デバイスクラスオブジェクト131は、これらの値が自デバイスクラスに合致するかを判定するテーブルを予め持っており、取得した物理デバイスオブジェクト151が自クラスに合致するかを判定することができる。

【0253】物理デバイス151のunique ID、unit IDはプリンタを示す値であったので、論理デバイスクラスオブジェクト131は、物理デバイスオブジェクト151に対応する論理デバイスオブジェクト131-1を生成し、初期化を開始させる。このときも論理デバイスクラスオブジェクトと論理デバイスオブジェクトは相互に参照関係を持ち、論理デバイスオブジェクト131-1は論理デバイスクラスオブジェクト131の配下として登録される(ステップS23~S24)。

【0254】この判定はunique ID、unit IDに限らず他の属性値の組合せによって行っても良

い。また、論理デバイスクラスオブジェクトがテーブルを持つことなく `unique ID` や `unit ID` をキーとして PC 81 の外にある検索サーバに問い合わせても良い。

【0255】以下、引き続いて論理デバイスクラスオブジェクト131は、1394管理オブジェクト121に物理デバイスへの参照を要求し、152、153、…について同様の作業を最後の物理デバイス156まで行う。FAX152の `unit 2` はプリンタの `capability` を持っているのものでこれも論理デバイスオブジェクト131-2としてプリンタクラスオブジェクトに登録される(ステップS21～S24)。

【0256】全ての物理デバイスオブジェクトについて作業が終了すると、登録した論理デバイスオブジェクト131-1、132-2からの初期化完了通知を待つ(ステップS25)。論理デバイスオブジェクト131-1、132-2からの初期化完了通知を受けると、プリンタクラスの論理デバイスクラスオブジェクト131は、論理デバイス管理オブジェクト122に初期化の完了を通知する(ステップS26)。

【0257】次に、論理デバイスオブジェクトの初期化について論理デバイスオブジェクト131-1を例に取りつつ説明する。図25に論理デバイスオブジェクト初期化手順の一例を示す。

【0258】論理デバイスオブジェクト131-1は、自身の属性値を初期化した後、物理デバイス151に初期化要求を発行して151からの完了通知を待つ(ステップS31、S32)。完了通知を受信するとプリンタクラスの論理デバイスクラスオブジェクト131に完了通知を発行する(ステップS33)。初期化要求を受信した物理デバイスオブジェクト151は、物理装置90に対応するデバイス制御コードを決定し、それを読み込んでデバイス制御オブジェクト161を生成し、物理デバイスオブジェクトに登録する。

【0259】次に、物理デバイスオブジェクトの初期化について物理デバイスオブジェクト151を例に取りつつ説明する。図26に物理デバイスオブジェクト初期化手順の一例を示す。

【0260】なお、物理デバイスオブジェクトの生成は1394管理オブジェクト121によって論理デバイスオブジェクトの生成以前に行われており、ここでの初期化は生成とは異り、また1394管理オブジェクト121が物理デバイスオブジェクト151を生成した時点ではプリンタ制御固有のコードは読み込まれていない。

【0261】ロードするデバイス制御コードは例えば次のようにして決定される。1394管理オブジェクト121は属性値 `unique ID`、`unit ID`、`capability` と論理デバイスクラスオブジェクトからデバイス制御コードのクラス名を求めるテーブルを持っており、物理デバイスオブジェクト151は139

4管理オブジェクト121に自身の持つ属性値 `unique ID`、`unit ID`、`capability` を含む問い合わせ要求を発行し、その返り値としてクラス名を得る(ステップS41)。デバイス制御コードの識別子は前述のように当該PCのファイルを示すパス名でよい。もちろん、PC81の外部に属性値に基づく問い合わせを発行して取得しても構わない。

【0262】上記の方法で得たクラス名から動的オブジェクトローディング機能により、デバイス制御コードがロードされてデバイス制御オブジェクト161が生成され、物理デバイスオブジェクト151に登録される。物理デバイスオブジェクト151は、デバイス制御オブジェクト161の属性値の初期化を行った後、ハードウェアの初期化要求を発行する(ステップS42～S44)。

【0263】クラス名に対応するコードがローカルに存在すればそれを読み込む。クラス名がリモートのネットワーク上の資源を示していれば、ネットワーク上から取得する。クラス名が明示的にネットワーク上の資源を指していない場合でも、コードがローカルに存在しない場合はネットワーク上の検索サーバなどを利用してネットワーク上の位置を取得し、コードを読み込む。

【0264】次に、デバイス制御オブジェクト161はハードウェアの初期化のためのレジスタ書き込みを行うパケットを準備し、1394トランザクションのシステムコールを呼び、物理装置90を初期化する。初期化が完了すると物理デバイスオブジェクト151は論理デバイスオブジェクト131-1に完了通知を発行する(ステップS45)。

【0265】ところで、物理デバイスオブジェクトには物理デバイスオブジェクト152のように2つ以上の論理デバイスオブジェクト(131-1、133-1)に登録されているもの。このような物理デバイスオブジェクトは2回以上の初期化要求を受けることになる。2度目の初期化では、属性値から決定したデバイス制御オブジェクトが1度目に獲得したデバイス制御オブジェクトと同一であるかどうかを比較し(ステップS44)、同一であれば同一のものを使用し、違っていれば新たにデバイス制御オブジェクトを読み込み、生成する。物理デバイスオブジェクト152ではプリンタクラス、FAXクラスに同一のデバイス制御オブジェクト162を使用するが、これはデバイス制御オブジェクトがプリンタとFAXの両方の `Java SPI` をサポートするものだからである。もし最初にロードしたデバイス制御オブジェクトがプリンタクラスの `Java SPI` のみをサポートしてFAXクラスをサポートしていなければ、新たに両方をサポートするデバイス制御オブジェクトを検索して入手するか、FAXクラスのサポートをやめる。もし両立ができなければ最初にロードされたクラスが優先されることとする。

【0266】さて、一般に論理デバイス種別が増えたときに、利用する可能性のある全ての論理デバイスクラスオブジェクトを予め用意しておくことはメモリなどの資源の利用の点で非効率である。また、一つの物理装置が多数の論理デバイスクラスオブジェクトから利用される可能性があり、かつ下位デバイス制御プログラム（本実施形態のデバイス制御オブジェクト）が上位論理デバイスクラスオブジェクトに依存して変更される場合には物理デバイスに合わせて上位論理デバイスを決定する手順は複雑になる。特に、IEEE 1394バスのように家庭に導入され、家庭内のネットワークとしても利用されるバスでは接続される機器を予め限定することは難しい。

【0267】むしろ利用者の利用形態によって規定される上位論理デバイスを利用者が決定して、接続された装置をその方法によって利用することが上記ネットワークにおいては適切である。このため本実施形態では、不明のデバイスクラスを設けることによって使用法が未知の装置をとりあえず認識し、詳しくは後述するように装置に合わせた上位論理デバイスを新たに付け加える方法を取っている。

【0268】1394管理オブジェクト121が複数の論理デバイスと属性値に対応するクラス名の表を持っており、物理デバイスオブジェクトが2度目の初期化を行う際には2つの論理デバイスクラスオブジェクトの名前と属性値を指定して1394管理オブジェクト121に問い合わせを行っても良い。

【0269】次に、不明の論理デバイスクラスオブジェクト134の初期化について説明する。

【0270】不明の論理デバイスクラスオブジェクト134は、131～133までの論理デバイスクラスオブジェクト134と同様、生成時に1394管理オブジェクト121への参照を受け取る。そして、論理デバイスクラスオブジェクト131～133の初期化と同様に151、…、156の各物理デバイスオブジェクトへの参照を得る。

【0271】不明の論理デバイスクラスオブジェクト134は、最初に物理デバイスオブジェクト151への参照を得る。不明の論理デバイスクラスオブジェクト134は物理デバイスオブジェクト151へ論理デバイスオブジェクトへの参照を持っているかどうかの問い合わせを行い、持っていれば物理デバイスオブジェクト151の認識を中止して、次の物理デバイスオブジェクト152への参照を入手する。物理デバイスオブジェクト151、152、153はいずれも他の論理デバイスオブジェクトに登録されているので不明のデバイスとしての登録は行わない。

【0272】一方、物理デバイスオブジェクト154は、論理デバイスオブジェクトからの参照を持っていない。ここで不明の論理デバイスクラスオブジェクト13

4は、物理デバイスオブジェクト154に対応する論理デバイスオブジェクト134-1を生成して自身に登録する。論理デバイスオブジェクト134-1は、物理デバイスオブジェクト154を自身に登録する。不明の論理デバイスオブジェクト134-1は、物理デバイスオブジェクト154へ初期化を要求しない。したがって、この時点では物理デバイスオブジェクト154にはデバイス制御オブジェクトは登録されない。

【0273】以下、物理デバイスオブジェクト155、156についても同様の初期化を行い、不明の論理デバイスオブジェクト134-2、134-3が生成されて、完了の通知を発行し、不明のデバイスクラスの初期化が完了する。

【0274】論理デバイス管理オブジェクト122は、予め定められた論理デバイスクラスオブジェクトの生成初期化と、それに続く不明の論理デバイスクラスオブジェクトの生成初期化が完了すると終了する。初期化が終了すると論理デバイス管理オブジェクト122はアプリケーションからのデバイスクラス一覧要求に答えることができる。初期化が完了する前はアプリケーションからの問い合わせに対して、利用不能の答を返す。

【0275】次に、アプリケーションからのデバイスの利用について説明する。ここでは、アプリケーションからプリンタ90を利用する場合を例にとって説明する。

【0276】なお、物理デバイスと論理デバイスとの間のインタフェースをJava SPI、論理デバイスとアプリケーションとの間をJava APIと呼ぶ。これらはOSとJavaとの間のAPIとは異なるものである。

【0277】アプリケーションプログラムは、OSへの問い合わせなどの所定の方法によりプリンタ90に対応する論理デバイスオブジェクト131-1への参照を知っているものとする。

【0278】例えば、アプリケーションは、論理デバイス管理オブジェクト122への参照を予め知っていて、論理デバイス管理オブジェクト122を通じてプリンタクラスへの参照を獲得し、プリンタクラスからプリンタ131-1への参照を入手する。または、装置構成に関するネーミングサービスが提供されていても良い。

【0279】アプリケーションプログラムは、postscriptファイルへの参照を引数として、論理デバイスオブジェクト131-1に印刷要求を発行する。

【0280】論理デバイスオブジェクト131-1は、ファイルのヘッダ情報からそれがpostscriptファイルであることを知り、postscriptファイルをビットマップイメージに展開する。そして、論理デバイスオブジェクト131-1は、ビットマップイメージとビットマップ以外の紙サイズ指定などの情報を含むオブジェクトへの参照を引数として、物理デバイスオブジェクト151に印刷要求を発行する。なお、論理デ



バイスオブジェクト 131-1 にて待ち行列処理を行うことが望ましい。

【0281】物理デバイスオブジェクト 151 は、デバイス制御オブジェクト 161 を通じて印刷イメージに対応するビットマップ情報をプリンタ 90 に転送する。すなわち、プリンタ 90 の予め定められた CSR レジスタ A に lock トランザクションによって PC81 が利用するフラグを書き込む。lock に成功してプリンタの使用権を獲得すると、次はデータを転送するための IEEE1394 バス上の Isochronous チャネルの 10 設定と、紙サイズ、トレイ情報などのプリンタの設定を行うトランザクションを発行する。チャネルを獲得したらビットマップ情報を転送し、転送が完了すると転送完了のトランザクションを発行してプリンタへの印刷指示を完了する。プリンタでの印刷状況はある CSR レジスタに表示されるので、物理デバイスオブジェクトがそれをポーリングすることによって印刷の完了を知る。

【0282】次に、不明のタイプとして登録されている装置の利用についてマッサージ装置 12 を例にとって説明する。

【0283】図 27 は論理デバイスクラスオブジェクトを追加したときのソフトウェア構造、図 28 はアプリケーションによる新規デバイスクラス追加要求手順の一例、図 29 は論理デバイス管理オブジェクト 122 による新規デバイスクラス追加手順の一例をそれぞれ示す。

【0284】アプリケーションは、論理デバイス管理オブジェクト 122 に論理デバイスクラスの一覧取得要求を発行する（ステップ S51）。不明の論理デバイスクラスオブジェクト 134 への参照を取得すると、不明のデバイスクラス 134 に論理デバイスの一覧取得を要求 30 する（ステップ S52, S53）。

【0285】アプリケーションは、一覧からマッサージ装置 92 に対応する論理デバイスオブジェクト 134-1 への参照を選択して利用可能な論理デバイス情報を要求する（ステップ S54）。

【0286】論理デバイスオブジェクト 134-1 は、物理デバイスオブジェクト 154 からその属性値を取得し、論理デバイス管理オブジェクト 122 に物理デバイスオブジェクト 154 が利用可能な論理デバイスクラスの検索要求を発行する。既述のように論理デバイス管理オブジェクト 122 は属性値から論理デバイスクラス名とを対応させるテーブルを持っている。このテーブルから論理デバイスクラス名またはそのリストが論理デバイス 134-1 に返却され、論理デバイス 134-1 は要求に対して論理デバイスクラス名を獲得し、論理デバイス情報としてアプリケーションに通知する。もちろん、ここでもデバイスクラス名の検索をネットワーク上のサーバに問い合わせることによって行っても構わない。ドライバオブジェクトの格納場所には少なくともマッサージ装置のデフォルトのドライバのオブジェクトコードと 50

利用法の自然言語による説明が格納されていることが望ましい。

【0287】アプリケーションは、使用する論理デバイスクラス名「マッサージ装置」を選択して論理デバイスクラス登録要求を論理デバイス管理オブジェクト 122 に発行する（ステップ S55, S56, S57）。

【0288】論理デバイス管理オブジェクト 122 は、指定されたクラス名に対応する新しい論理デバイスクラスオブジェクト 135 を生成し（ステップ S61）、不明の論理デバイスクラスオブジェクト 134 および不明のクラスとリンクされている FAX の論理デバイスクラスオブジェクト 133 との間に挿入する（ステップ S62）。そして、今まで不明のデバイスクラスに登録されていた論理デバイスオブジェクト 134-1, 134-2 を削除して（ステップ S63）、論理デバイスクラスオブジェクト 135 に初期化要求を発行する（ステップ S64）。この状態を図 27 に示す。以後のステップ S65 とステップ S66 の手順と新規論理デバイスクラスオブジェクト 125 の初期化手順は既に説明したものと同様である。なお、図 27 中、135-1 は新たに生成された論理デバイスオブジェクトである。

【0289】ここでは、不明のデバイスに対応する論理デバイスを検索する例について説明したが、既存の物理デバイスの組合せから、対応する新しい論理デバイスを検索しても良い。例えば、プリンタとスキャナとモデムの機能を持つ各物理デバイスの組合せによって利用可能な新しい論理デバイス FAX を検索するような場合である。

【0290】上記の機能を備えることにより、普段使用しないデバイスを制御するための不要なプログラムはシステムの初期化時には読み込まず、必要になった時点で読み込むことにより、PC のメモリなどの資源を節約してコストを低下させることができる。

【0291】次に、1394 デバイスの構成変更イベントについて説明する。

【0292】PC が利用できる 1394 装置の接続状況は変化し得る。しかも、IEEE1394 バスでは動作中にコネクタの挿抜によって構成を変更することができる。この変更結果は、デバイスオブジェクトの追加や削除として論理デバイスに反映されなければならない。また、ある装置によるデバイスの占有が終了すれば、そのデバイスは他の装置で利用可能になる。以下では、このような構成の変化を認識する手順について説明する。

【0293】バスリセットが発生すると、OS の 1394 インタフェースから 1394 管理オブジェクト 121 にバスリセットが通知される。1394 管理オブジェクト 121 は、再度、TOPOLOGY\_MAP および SPEED\_MAP から 1394 物理装置の一覧を取得し、それらの unique ID を取得して既知のデバイスとの対応をとる。

【0294】まず、バスリセット後に、1394管理オブジェクト121は、全ての物理デバイスオブジェクトの `exist` 属性値を「不明」とする。

【0295】装置から取得した `unique ID` が既存の物理デバイスオブジェクトの保持する `unique ID` に一致する場合、その装置は既に登録済みであり `exist` を「存在」とする。

【0296】装置から取得した `unique ID` が既存の物理デバイスオブジェクトの保持する `unique ID` と一致しない場合、その装置は新しく追加された装置であり、物理デバイスオブジェクトを生成初期化し、`exist` を「存在」とする。

【0297】この操作を全ての `NODE ID` について行った後、`exist` が不明になっている物理デバイスオブジェクトは対応する装置が取り去られたものとして、それを削除する。物理デバイスオブジェクトを削除すると、対応する論理デバイスオブジェクトにそれが通知され、論理デバイスオブジェクトは終了処理を行い、対応するデバイスクラスに通知した後、自身を消去する。

【0298】追加、削除による参照の修正作業が完了すると、1394管理オブジェクト121は、論理デバイス管理オブジェクト122に構成の変更を通知する。もし構成に全く変化がなければ、通知は行わない。

【0299】通知を受信した論理デバイス管理オブジェクト122は、各デバイスクラスに構成変更要求を発行する。

【0300】構成変更要求を受信したプリンタクラス131は、初期化と同様に、論理デバイスオブジェクト122に物理デバイスの参照を要求する。初期化と異るのは、初期化では全ての物理デバイスオブジェクトが対象だったのに対し、構成変更では新しく追加された物理デバイスオブジェクトだけが対象になることである。各論理デバイスクラスは、新しく追加された物理デバイスの属性を読み出し、自クラスに一致するかを判定して一致すれば、対応する論理デバイスオブジェクトを生成、登録する。

【0301】全てのクラスの構成変更が完了すると、不明のクラスの初期化が行われ、追加されたデバイスでどの論理デバイスとして登録されなかった物理デバイスオブジェクトは不明のクラスに登録される。

【0302】次に、占有状態の変更について説明する。

【0303】初期化においてレジスタの読みとりによって他ノードによる占有状態にあると判断されて認識から除外された装置に対して、1394管理オブジェクト121は周期的なポーリングを行ってデバイス占有状態の変更を検出する。非占有状態になったデバイスは、バスリセットで記述したデバイス構成の変化と同様の手順で登録する。もし当該PCが前記装置を排他的に占有するのであれば、それを装置の占有状態を示すレジスタにそ

れを示す値を書き込む。

【0304】次に、ローカルの論理デバイスオブジェクトが古い場合について説明する。

【0305】このような場合、論理デバイスクラスオブジェクトはバージョン番号の属性を持っている。アプリケーションは、論理デバイス管理オブジェクト122に論理デバイスクラスオブジェクトの更新要求を発行することができる。論理デバイス管理オブジェクト122は、更新が要求された論理デバイスクラスオブジェクトのバージョン番号を取得する一方、予め指定された論理デバイスクラスオブジェクトのアーカイブサーバに最新のバージョン番号を要求する。もしローカルの論理デバイスクラスオブジェクトのバージョン番号が最新のものに一致すれば、もしローカルの論理デバイスクラスオブジェクトのバージョン番号が若ければ、アーカイブサーバから最新のデバイスクラスを読み込み、オブジェクトを生成する。この時点ではこの論理デバイスクラスオブジェクトは動作しない。

【0306】オブジェクトの生成に成功すると、既存の論理デバイスに終了通知を発行し、動作を終了させる。プリンタならば、新たな印刷ジョブの受付を中止し、実行中の印刷ジョブの終了を待つ。実行中のジョブと終了処理が完了すると、論理デバイス管理オブジェクト122に完了を通知する。論理デバイス管理オブジェクト122は、古い論理デバイスの持つ参照関係を変更し、新しい論理デバイスオブジェクトが参照関係を引き継いだ後、論理デバイスの開始通知を論理デバイスクラスオブジェクトに送る。通知を受信した論理デバイスクラスオブジェクトは動作を開始する。

【0307】（第3の実施形態）本実施形態では、ネットワークに接続されたPC（第2の実施形態の機能を持つもの）がIEEE1394以外のネットワークを経由して接続された遠隔のIEEE1394装置を制御する場合について説明する。

【0308】図30に、本実施形態に係るシステムの構成例を示す。401、411、434はそれぞれ第1の家庭451内にあるPC、ネットワーク接続装置、トースタを表す。402、412、431、432、433はそれぞれ第2の家庭452内にあるPC、ネットワーク接続装置、プリンタ、FAX、マッサージ装置を表す。なお、図30中のネットワーク接続装置以外の各構成要素は図1中の対応するものと同様のものである。

【0309】家庭451内のLANと家庭452内のLANとの間はISDN通信回線413で結ばれているものとする。通信回線413はネットワーク接続装置411、412で終端されている。

【0310】家庭451内のLANにおいて、接続装置411、PC401、トースタ434の間は1394バス421によって接続されている。

【0311】家庭452内のLANにおいて、接続装置

412、PC402、プリンタ431、スキャナ432、マッサー装置433の間は、1394バス422によって接続されている。

【0312】ネットワークはインターネットプロトコルを使うインターネットであり、PC401、402と接続装置411、412のみが予めIPアドレスを持っているものとする。IPアドレスは固定的に割り当てられたものでも、DHCP、PPPなどのプロトコルによって割り当てられたもののどちらでも良い。

【0313】ここで、家庭451にあるPC401が家庭452の機器との接続を試みる。PC401はインターネットプロトコルによってネットワーク接続装置411に家庭452を示す文字列、例えばその氏名である「高島由彰」を含む接続要求を送る。そして、ネットワーク接続装置411は例えば「高島由彰」に対応する家庭452の電話番号を検索するデータベースを持っており、家庭452の接続装置412への接続を行う。

【0314】接続装置412は、接続の前には接続元の認証を行う。認証ステップで許可されなければ接続は行わないものとする。認証は例えば発信電話番号表示を用い、予め第2の家庭452にて登録した電話番号以外の接続を認めないことができる。接続が完了すれば、家庭451、452の間でインターネットプロトコルによる通信を行うことができる。

【0315】ただし、セキュリティ保護の観点から接続が完了しても接続装置がその家庭の方針によってパケットの通過の可／不可を判断するいわゆるファイアウォールとして動作することが望ましい。ここでは家庭451と家庭452の間は予め全てのパケットが通過し、全ての操作が行えるよう、設定されているものとする。

【0316】なお、この接続は電話による接続ではなくIP接続であっても構わない。

【0317】さて、家庭451にあるPC401はサービス管理サーバのアドレスを接続装置411のデータベースから取得する。アドレスは予め接続装置411に登録されているものとする。次に、PC401はサービス管理サーバに利用可能なサービスの問い合わせを行う。ここではネットワーク接続装置412がサービス管理サーバを兼ねているものとする。

【0318】サービス管理サーバは、問い合わせに回答して当該ネットワーク中のサービスおよびそのサーバの情報を返す。ここでは次のサービスが登録されている。

【0319】printer:pc2  
Java ORB:pc2

左の列はサービスの種別、ここではサービスに割り当てられた多重化識別子（例えばポート番号）を表し、右の列はサービスの所在、ここではPC402のIPアドレスを表す。このようなサービス情報提供手段はインターネットにおいてはサービスロケーションプロトコルとして知られている（例えば文献「インターネットドラフト

draft-ietf-svrloc-protocol-16.txt」）。

【0320】これらはサービスを提供するホスト、ここではPC402が起動時に予め定められたネットワーク接続装置412に登録する。

【0321】printerはインターネット標準で定められた印刷サービスを表し、515のUDP/TCP番号が割り当てられている。ここで使用するプロトコルは予めインターネット標準によって規定されている。

【0322】Java ORBは、Javaオブジェクトを外部から利用できるサービスを表している。このようなサービスは現在まだ標準としては規定されていないが、ここではJava ORBを表すポート番号について予め合意があるものとする。

【0323】次に、リモートの1394装置を利用する2種類の方法、

方法1) インターネットでは標準化されたネットワークサービスを介して利用する方法

方法2) 1394プロキシオブジェクトを通じて利用する方法について説明する。

【0324】方法1では、PC402にIEEE1394インタフェースによって接続されたプリンタ431をインターネットプロトコルとして標準化されたprinterサービスによって利用する。PC401は、printerプロトコルのクライアントを持ち、プリンタ431を表す論理名称を指定してインターネット形式で標準化された形式の印刷要求をPC402に送り、プリンタを利用する。この方法では、ネットワークを伝送するメッセージには装置依存の要素は含まれない。PC401のアプリケーションは、プリンタサービスとプリンタ431に対応する装置の名前を指定して要求するだけで、装置の特性は意識しない。

【0325】方法2は、概略的には、ネットワークを伝送するメッセージに、IEEE1394形式のパケットがIPパケットにカプセル化された形式を使うものである。PC401はあたかもプリンタ431がローカルの1394バスに接続されているかのように利用することができる。

【0326】以下、上記の方法2についてさらに詳しく説明する。

【0327】図31にクライアント側の接続前におけるネットワーク経由サービスのソフトウェア構造を示し、図32にクライアント側の接続後におけるネットワーク経由サービスのソフトウェア構造を示し、図33にプロキシ側の接続前におけるネットワーク経由サービスのソフトウェア構造を示し、図34にプロキシ側の接続後におけるネットワーク経由サービスのソフトウェア構造を示す。なお、図31～図34中のIP機能以外の各構成要素は、図2中の対応するものと同様の機能を有するものである。IP機能504は、TCP/UDP/IPな

ど、一連のインターネットプロトコル（TCP/IPプロトコルシート）の諸機能である。

【0328】図31は1394スタブオブジェクト生成前のクライアントPC401のソフトウェア構成であり、501は論理デバイス管理機能、502は2次記憶管理機能、511、512は502の配下にあるそれぞれのハードディスクの管理機能、503は1394インタフェース管理機能、513、514はそれぞれの1394インタフェース管理機能、504はIP機能、434はトースタ、509はトースタ機能を示すunit 1、521は1394管理オブジェクト、522は論理デバイス管理オブジェクト、531、532、533、534はプリンタ、スキャナ、マッサージ装置、不明の各論理デバイスクラスオブジェクトに対応する。534-1は不明のクラスの論理デバイスオブジェクトである。551はトースタ434に対応する物理デバイスオブジェクトを表す。561は物理デバイスオブジェクト551に対応するドライバオブジェクト（制御プログラム）を表す。

【0329】図32は1394スタブオブジェクト生成後のクライアントPC401のソフトウェア構成であり、図31の構成に1394スタブオブジェクト571、論理デバイスオブジェクト533-1、533-2、物理デバイスオブジェクト551、ドライバオブジェクト562、563が付加されている。

【0330】図33は1394プロキシオブジェクト生成前のプロキシ側PC402のソフトウェア構成であり、601は論理デバイス管理機能、602は2次記憶管理機能、611、612は602の配下にあるそれぞれのハードディスクの管理機能、603は1394インタフェース管理機能、613、614はそれぞれの1394インタフェース管理機能、431はプリンタ、432はFAX、433はマッサージ装置をそれぞれ表す。621は1394管理オブジェクト、622は論理デバイス管理オブジェクト、631、632、633、634はプリンタ、スキャナ、FAX、不明の各デバイスクラスに対応する論理デバイスクラスオブジェクト、651、652、653、654、655はそれぞれプリンタのunit 1（図中604）、FAXのunit 1（図中605）、unit 2（図中606）、マッサージ装置のunit 1（図中607）、unit 2（図中608）に対応する物理デバイスオブジェクト、631-1、631-2、632-1、633-1、634-1、634-2はそれぞれ論理デバイスクラスの配下にある論理デバイスである。661、662、663はそれぞれ物理デバイスオブジェクト651、652、653に対応するドライバオブジェクトを表す。

【0331】図34は1394プロキシオブジェクト生成後のプロキシ側PC402のソフトウェア構成であり、図33の構成に1394プロキシオブジェクト68

1、論理デバイスクラスオブジェクト635、論理デバイスオブジェクト635-1、635-2が付加され、論理デバイスオブジェクト634-1、634-2が削除されている。

【0332】PC401は、サービス情報に基づいてリモートのPC402のIPアドレスを指定して1394スタブオブジェクト571を生成する。1394スタブオブジェクトは、リモートのPC402のJava ORBポートに1394プロキシオブジェクトに割り当てられたクラス名を指定して、その生成を要求する。

【0333】あるホストから別のホストのJava ORBを利用するときには、受信側のセキュリティマネージャがその接続を許すか否かを判断する。これは送信側のオブジェクトによるORBの利用要求によって自動的に行われるものとする。

【0334】ここでは、PC401からのORB利用要求がPC402によって受け付けられたものとし、PC402では要求通り1394プロキシオブジェクト681が生成され、その参照がPC402の1394スタブオブジェクトに返却される。1394スタブオブジェクト571は、以後の要求を1394プロキシオブジェクト681を通じて行う。なお、PC402が要求前に予め1394プロキシオブジェクト571を生成しておき、当該オブジェクトから起動できるメソッドのみが利用できるORBを1394サービスとしてあるポートに割り当てても構わない。これは、1394に限定したサービスを提供したい場合に有効である。

【0335】1394プロキシオブジェクト681は、参照を受けると、不明クラスの論理デバイスに対応する物理デバイスへの参照を獲得し、1394スタブオブジェクト571に通知する。

【0336】1394スタブオブジェクト571は、上記参照を獲得すると、1394管理オブジェクト522に1394管理オブジェクト自身を登録し、1394デバイスを再構成する要求を発行する。

【0337】1394管理オブジェクト522は、この要求によって1394プロキシオブジェクト681によって再構成を開始し、物理デバイスオブジェクトへの参照を要求する。1394スタブオブジェクトは571、1394プロキシオブジェクト681から獲得した物理オブジェクトへの参照654、655を順番に1394管理オブジェクト521に渡す。ここから属性値を取りだし、1394管理オブジェクト521は第2の実施形態で説明した初期化の場合と同様の手順で物理デバイスオブジェクト552、553を作成する。ただし、ここで作成した物理デバイスオブジェクト（以下、スタブデバイスオブジェクトとよぶ）は、リモートにある物理デバイスオブジェクトへの参照を保持しており、ローカルの物理デバイスオブジェクトでは1394インタフェースへのトランザクション要求として処理される入出力

が、スタブデバイスオブジェクトでは1394スタブオブジェクト571との間の入出力として処理される点異なる（なお、その詳細は後述する）。

【0338】次に、論理デバイス管理オブジェクト522による論理デバイスクラスオブジェクト533の初期化、それに続く論理デバイスオブジェクトの初期化が行われる。スタブオブジェクト552、553は物理デバイスオブジェクト654、655に対応しマッサージ装置クラスに合致する。リモートのPC402ではマッサージ装置クラスは利用されていないため、これらの装置は不明の装置として認識されているが、ローカルのPC401ではマッサージ装置クラスが登録されているので、論理デバイスオブジェクト533-1、533-2として登録される。

【0339】論理デバイスオブジェクト533-1からスタブオブジェクト552に初期化要求が行われると、リモートの1394プロキシオブジェクト681に対応する物理デバイスオブジェクト654の使用要求を発行する。

【0340】リモートの1394プロキシオブジェクト681は、プロキシクラスの論理デバイスクラスオブジェクト635を生成し、登録する。物理デバイスオブジェクト654に対応する論理デバイスオブジェクト634-1を消去し、プロキシクラスのデバイスをつかってプロキシ論理デバイスオブジェクト635-1として登録する。

【0341】プロキシ論理デバイスオブジェクト635-1が生成されると、スタブオブジェクト533-1との間とにポート番号を割り当てて論理コネクションを生成する。ここで使うポートはJava ORBとは別のポートを用いて1394パケットの伝送を行うためのものである。

【0342】制御プログラムが読み込まれて動作するのはローカルのPC401のスタブオブジェクト552の側であり、リモートのPC401の物理デバイスオブジェクトはポートから入力したパケットを1394インタフェースに出力し、1394インタフェースから入力したパケットをポートに転送するだけであり、装置の状態制御はスタブオブジェクト552の制御プログラム562が行う。ただし、バスリセットなどのイベントは伝達する。

【0343】論理デバイスオブジェクト533-2からスタブオブジェクト553に初期化要求が行われた場合についても同様である。

【0344】以上の手順により、リモートの物理デバイスをローカルの論理デバイスから利用できる環境が整う。

【0345】次に、動作について説明する。ここでは、スタブの物理デバイスオブジェクト552を例に取って説明する。

【0346】物理デバイスオブジェクト552が論理デバイスドライバ531-1から処理要求を受けとり、それに対応する1394形式のパケットを生成する。1394形式のパケットはIPパケットにカプセル化されて前記確保した論理コネクションに出力される。

【0347】ここで、物理デバイスオブジェクト552からの出力は、IEEE1394インタフェース503に直接出力されるのではなく、論理コネクションからIP機能504を通して処理される。

【0348】ここでは、IP機能504の先はIEEE1394インタフェースによって処理されているが、これはイーサネットやATMであっても構わない。つまり、IEEE1394インタフェースを持っていないPCでもIEEE1394装置があたかもローカルに接続されているかのように制御を行うことができる。

【0349】さて、IPパケットにカプセル化されたパケットはプロキシ論理デバイスオブジェクト635-1に届き、1394形式のパケットが取り出され、物理デバイスオブジェクト654に渡される。物理デバイスオブジェクト654はこれをそのまま1394インタフェースに出力し、装置433のレジスタに作用する。

【0350】IEEE1394のアイソクロナスチャネルの入出力は前述の方法では中継できない。IEEE1394においてはIEC1883で定められた方式でレジスタを操作することによってアイソクロナスチャネルが設定される。

【0351】スタブオブジェクト552から自装置宛に発行されたIEC1883の設定要求は、1394スタブオブジェクト571転送され、1394スタブオブジェクト571はアイソクロナスチャネルに対応するインターネット上のコネクションを設定する。

【0352】IEEE1394のアイソクロナスチャネルでは確保する帯域を指定することができる。上記設定要求にはその情報が含まれているので、インターネット上で帯域を確保する手段例えばRSPVなどの手段によってコネクションの帯域を指定することが望ましい。

【0353】なお、本実施形態では、家庭451内のLANと家庭452内のLANとの間はISDN通信回線413で結ばれているものとしたが、第1の実施形態と同様に、家庭451内のLANと家庭452内のLANとの間の接続をインターネットとし、この場合に端末のIPアドレスにはグローバルIPアドレスを用いるようにしてもよいし、例えばNAT(Network Address Translation)等のアドレス変換を用いて、公衆網2がインターネットである場合に少なくともネットワークの相互接続を行うノード（図1ではAV接続装置端末）にグローバルIPアドレスを用い、その他のノードにはプライベートIPアドレスを用いることができるようにしてもよい。

【0354】なお、以上の各機能は、ソフトウェアとし

ても実現可能である。また、上記した各手順あるいは手順をコンピュータに実行させるためのプログラムを記録した機械読取り可能な媒体として実施することもできる。

【0355】本発明は、上述した実施の形態に限定されるものではなく、その技術的範囲において種々変形して実施することができる。

【0356】（第4の実施形態）第1の実施形態では、図12に示したように、第1のAV接続装置4に対して第2の家庭ネットワーク内の収容されたサービス提供装置（例えば、DVDプレーヤ8、デジタルVTR9、PC10）に具備されたWWWサーバやデジタルアルバムサーバ機能等、プリンタ11）の提供するサービスに関する情報（以下、簡単にサービス情報と呼ぶ）を通知するのに、サービスロケーションプロトコルを用いる場合を示した。

【0357】第4の実施形態では、WWW（World Wide Web）サーバと、ホームページを用いて、これを行う場合について説明する。

【0358】第4の実施形態におけるシステム構成例は図1と同様である。ここでも、第1の実施形態と同様に、第1の家庭内ネットワークの第1のAV接続装置4から、第2の家庭内ネットワーク内の各種サービス提供装置（DVDプレーヤ8、デジタルVTR9、PC10）に具備されたWWWサーバ、デジタルアルバムサーバ機能等、プリンタ11）の遠隔制御を行うことを考える。

【0359】図35は、第4の実施形態における、第2のAV接続装置5の内部構成例を示したもので、1394I/F1401、データリンクスイッチ1402、公衆網I/F1403、IP処理機能1404、FANP処理機能1405、1394AVコマンド処理機能1408の各部の動作は、図2の同一機能部と同様で、異なる点について説明する。すなわち、図2のサービスロケーション処理機能27、1394/IPコマンド変換機能29が、図35では、それぞれホームページ処理機能1407、HTTP/RTSP処理機能1409に置き換えられている。

【0360】1394/IPサービスロケーション処理機能1406は、第1の実施形態と同様に、IEEE1394バスに接続されているサービス提供装置の提供するサービスを検索し、あるいはその登録を受け、1394バス上にどのようなサービス提供装置が存在し、どのようなサービスを提供するのかを認識し、要求された場合など必要に応じて、サービス情報を外部に通知する機能を持つ。また、このようにして得られた各サービス提供装置毎のサービス情報を後述するホームページ処理機能1407に通知し、第2の家庭内ネットワークの状況を表示するホームページの作成を促す。

【0361】ホームページ処理機能1407は、WWWサーバ機能を持つ。1394/IPサービスロケーシ

ン処理機能1406から、第2の家庭内ネットワークのサービス情報を受け取り、それをホームページとしてまとめる。例えば、各サービス提供装置を表すアイコン、文字列をホームページ上に配置する。そして、各サービス提供装置を遠隔制御するためのコマンドを、それぞれに対応するホームページ上の各々のサービス提供装置を表すアイコン、文字列にリンクさせる。このようにして作成されたホームページに例えば公衆網2を介してアクセスがあった場合には、必要に応じて要求されたホームページを送信したり、公衆網2を介して受信した遠隔制御のためのコマンドをHTTP/RTSP処理機能1409に転送するようになっている。詳細は後述する。

【0362】ここで、サービス提供装置を遠隔制御するためのコマンドとは、HTTPあるいはRTSP（WWWサーバ中のリアルタイムメディアを遠隔操作するためのプロトコル）等に適したものである。HTTPに適した遠隔制御のためのコマンドをHTTPコマンド、RTSPに適した遠隔制御のためのコマンドをRTSPコマンドと呼ぶ。

【0363】HTTP/RTSP処理機能1409は、内部にHTTPデーモンあるいはRTSPデーモンを有しており、ホームページ処理機能1407から転送されてきたHTTPコマンドあるいはRTSPコマンドに対する処理を行う機能と共に、そのコマンドの宛先が、第2のAV接続装置5が代理となって公開しているサービスに割当てられているものである場合には、それを必要に応じてIEEE1394コマンドに変換し、1394AVコマンド処理機能1408を介して、1394バス上の機器の制御を行う機能（代理処理）も有する。

【0364】次に、第2の家庭内ネットワークにおいて、第2のAV接続装置5が第2の家庭内ネットワークに接続された各サービス提供装置のサービス情報を取得する手順について説明する。これは、第1の実施形態と同様である。即ち、図3に示したように、第2のAV接続装置5は、接続された機器（DVDプレーヤ8、デジタルVTR9、PC10、プリンタ11）のコンフィグレーションメモリを読み取ることと、図9に示したように、サービスロケーションプロトコルを用いることとで、第2の家庭内ネットワークに接続されたサービス提供装置のサービス情報を取得する。

【0365】なお、コンフィグレーションメモリに含まれる情報は、図4、図5、図6の様なものがあってもよい。また、図10に示した形式でサービス情報が登録されていてもよい。

【0366】さて、この時点で、第2のAV接続装置5は、コンフィグレーションメモリの読み込みを通じて、1394ノードとしてDVDプレーヤ8、デジタルVTR9、PC10、プリンタ11を認識する。また、サービスロケーションプロトコルを通じて、さらに、WWWサービス、デジタルアルバムサービス、エアコンサービ

ス、電子レンジサービスのそれぞれを認識する。ここで、第2のAV接続装置5は、エアコンサービスと電子レンジサービスはPC10にて提供されるサービスであると認識する。

【0367】さて、第2のAV接続装置5は、この収集したサービス情報に基づき、「その家には何があるか（どんなサービス提供装置、どんなサービスが存在するか）」を紹介するホームページを作成する。

【0368】作成されるホームページは、例えば、図36に示すように、ユーザに認識させたいサービス提供装置毎に、それらを表すアイコンや文字列などを列挙するものである。このホームページは、例えばその家のWWWサーバがデフォルトで紹介する最初のホームページの中の、例えば「わが家の電気機器」といった文字列なり、アイコンなりからのハイパーリンクで到達できるように、これを構築してもよい。ちなみに、この「わが家の電気機器」のホームページに移る際は、許可を得ていない他人に侵入されないように、何らかの認証手続きを経るのが望ましい。

【0369】図36に示したようなホームページ中のアイコン、文字列をクリックすると、それに対応するサービス提供装置あるいはサービス毎のホームページが現れるようにする。例えば、図36のDVDプレーヤのアイコンをクリックすると、それにリンクされた図39に示すような「DVDプレーヤのホームページ」が表示されるようにしてもよい。

【0370】このような構成の例えば図36に示すようなホームページを作成するために、ホームページ処理機能1407は、例えば図37のフローチャートに示すような手順を踏む。

【0371】まず、1394/IPサービスロケーション処理機能1406に登録されているサービス情報を、例えばサービス提供装置毎に1つずつ読み出し、各サービス提供装置毎のホームページ（例えば、図39に示すような「DVDプレーヤのホームページ」）を作成する（ステップS101～ステップS102）。

【0372】図38に示すフローチャートは、ステップS102のサービス提供装置毎のホームページ作成処理手順を示したものである。

【0373】1394/IPサービスロケーション処理機能1406に具備されている各サービス提供装置毎のRTSPコマンド対応テーブル1410（図50参照）を参照して各サービス提供装置の予め定められたコマンド群（ホームページを通して、ユーザに公開するサービス提供装置の制御のためのコマンド群）を取得し（ステップS111）、各コマンド毎にそれに対応するアイコンあるいは文字列を作成する（ステップS112）。例えば、サービス提供装置がDVDプレーヤの場合、図50のRTSPコマンド対応テーブルから「再生」を指示するための「PLAY」というRTSPコマンドを取得

し、そのコマンドに対応するアイコン（図39のアイコン1206）を作成する。

【0374】RTSPコマンド対応テーブル1410は、各サービス提供装置毎にRTSPコマンドが記述してある。例えば、DVDプレーヤ8の場合、コマンド群としては、電源オン、電源オフ、再生、巻き戻し、前の曲、早送り、次の曲、停止、一時停止の各RTSPコマンドが挙げられる。また、図50に示すように、第2のAV接続装置5にて代理処理を行っているDVDプレーヤ8、デジタルVTR9の場合は、各RTSPコマンドに対応する1394コマンドをともに記憶されている。

【0375】なお、RTSPコマンド対応テーブル1410は、後述する図42の1394/IPコマンド変換機能1423に具備されるテーブルと同一のものであってもよい。

【0376】さて、ステップS112で作成されたアイコンあるいは文字列に、そのサービス提供装置のRTSPコマンドを対応付ける（ステップS113）。例えば、図39の「再生」のアイコン1206には、「PLAY」というRTSPコマンドを対応させる。例えば、アイコンあるいは文字列と、それに対応するRTSPコマンドとをテーブルに登録しておいてもよい。

【0377】なお、第2のAV接続装置5にて代理処理を行っているDVDプレーヤ8、デジタルVTR9の場合は、第2のAV接続装置5のアドレスとDVDプレーヤ8、デジタルVTR9それぞれのIEEE1394ノードに割り当てたポート番号をRTSPコマンドに含める。

【0378】以上をそのサービス提供装置の提供する全てのコマンドに対し行い、作成されたアイコンあるいは文字列を適当に配置して、例えば図39に示すようなサービス提供装置のホームページを作成する（ステップS114～ステップS115）。

【0379】次に、図37の説明に戻り、図38のフローチャートに従って作成された各サービス提供装置毎のホームページへのハイパーリンクを持った、そのサービス提供装置のアイコンあるいは文字列を作成あるいは取得する（ステップS103）。すなわち、サービス提供装置毎のアイコン等は、そのサービス提供装置のコンフィグレーションメモリから取り出してもよいし、サービスロケーションプロトコルにより、このアイコンの位置を一意に指定できるURLが提供され、そこに取に行く形で入手してもよい。

【0380】ステップS103で得たアイコンを、「わが家の電気機器」のホームページに貼り付ける。以上の手順を第2の家庭内ネットワークに収容されている全てのサービス提供装置について行い、図36のようなホームページが作成できる（ステップS104）。

【0381】さて、図36に示したホームページ上のサービス提供装置を表すアイコンあるいは文字列のうち、

DVDプレーヤを表すアイコン1101をクリックすると、このアイコンに対応付けられたサービス提供装置のホームページ、すなわち、図39に示したようなDVDプレーヤのホームページが現れる。

【0382】図39に示したようなサービス提供装置のホームページ、すなわち、この場合、DVDプレーヤのホームページは、DVDプレーヤの操作盤として用いて、ユーザはDVDプレーヤ8を遠隔制御することができる。例えば、「電源ON」ボタンをクリックすると、DVDプレーヤ8の電源がオンになる、といった具合である。

【0383】次に、例えば、第1の家庭内ネットワークのPC6から第1のAV接続装置4、公衆網2を介して、第2の家庭内ネットワーク内の各種サービス提供装置（DVDプレーヤ8、デジタルVTR9、PC10に具備されたWWWサーバ、デジタルアルバムサーバ機能等、プリンタ11）を遠隔制御する場合の処理動作を図40に示すシーケンス図を参照して説明する。

【0384】第1の家庭内ネットワークに収容されているPC6にて所定のWWWブラウザを用いることにより、図36に示したようなホームページが提示されたとする。ユーザが、例えばDVDプレーヤ1101のアイコンをクリックすると、それに対応づけされたDVDプレーヤのホームページを要求するHTTPメッセージがPC6から出力される。

【0385】このメッセージを受けて、第1のAV接続装置4では第2のAV接続装置5に対して、DVDのホームページの送出要求を行う（ステップS4501）。例えば、「GET/appliances/dvd.html HTTP/1.1」というメッセージが第1のAV接続装置4から第2のAV接続装置5に送信される。

【0386】これを受けて、第2のAV接続装置5は、例えば図39で示したようなDVDプレーヤのホームページのテキスト（図41参照）を第1のAV接続装置4に対して送付する（ステップS4502）。

【0387】図41に示すように、例えば「再生」のアイコン1206に付与されるハイパーリンクは、再生を指示するためのRTSPの「PLAY」コマンドであり、その接続先となるノード（本実施形態の場合、第2のAV接続装置5のIPアドレス、即ち「192.168.1.254」と、そのポート番号（本実施形態の場合「2000」）とが付加されている。このようにすることにより、「再生」のアイコン1206をクリックすれば、ユーザは、RTSPの「PLAY」コマンドを送信先のアドレスを気にすることなく所望のノードの所望のポートに送出することができるようになる。もっと、RTSPを使った遠隔制御をハイパーリンクの関連付けを通して行うことができるようになる。

【0388】さて、第1のAV接続装置のユーザは、D

VDのホームページを受け取ると、DVDプレーヤの遠隔操作を開始できる。例えば、図39のホームページの「電源ON」のアイコン1201をクリックしたとする（ステップS4503）。「電源ON」のアイコン1201には、例えば、RTSPの「SETUP」コマンドがハイパーリンクにより対応づけられている。よって、「SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport: rtp/udp;port=5500」といコマンドデータが第1のAV接続装置4から第2の接続装置5に送信される（ステップS4504）。このコマンドデータによって、第1のAV制御装置4は、RTSP/UDPの各プロトコルを使用してデータを送信し、受信側のポート番号は「5500」を用いることを要求している。

【0389】これを受け取った第2のAV接続装置5の動作を以下に説明する。第2のAV接続装置のHTTP/RTSP処理機能1409の内部構成例を図42に示す。上記RTSPの「SETUP」コマンドデータは、HTTP/RTSP主処理機能1421に到達する。ここでは、まず、「SETUP」コマンドデータ中、ポート番号「2000」は、1394ノードであるDVDプレーヤ8に割り当てられているポート番号である事を認識し、RTSP代理機能1422に制御が渡される。

【0390】RTSP代理機能1422は、1394/IPコマンド変換機能1423内のテーブルを参照して、対応する1394AV/Cコマンド（本実施形態の場合、電源オンを意味するAV/Cコマンド）を見つけ、該当する1394ノード（本実施形態の場合、DVDプレーヤ8）に対して、1394AVコマンド処理機能1408を通して、上記AV/Cコマンドを発行する（ステップS4505）。

【0391】これに成功すると、第2のAV接続装置5は、第1のAV接続装置4に対して、制御完了を意味するRTSPの「OK」コマンドデータ（例えば、「RTSP/1.0 200 1 OK Session: 1234」）を送出する（ステップS4506）。その際に、RTSPコマンドには、このセッションを通して一意の番号として、セッション番号（本実施形態の場合、「1234」）を付加している。第1のAV接続装置4のブラウザは、このセッション番号を保持し、以下同一の装置に対してRTSPコマンドを発行する場合、セッション番号「1234」をコマンドに付加する。

【0392】次に、ユーザは、図39のホームページの「再生」のアイコン1206をクリックしたとする（ステップS4507）。「再生」のアイコン1206には、例えば、RTSPの「PLAY」コマンドがハイパーリンクにより対応づけられている。よって、このハイパーリンクによって対応づけられた第2のAV接続装置5（IPアドレス「192.168.1.254」、ポ



ート番号「2000」、セッション番号「1234」) に対して、「PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234」というコマンドデータが第1のAV接続装置4から送信される(ステップS4508)。

【0393】これを受信した第2のAV接続装置5は、DVDプレーヤ8の再生を促すべく、IEC1883による同期チャネルの確保(ステップS4509)、1394AV/CプロトコルのDVDプレーヤ8に対する「PLAY」コマンドの実行(ステップS4510)を行い、映像データの上記確保した同期チャネルに対する送出を促す。そして、DVDプレーヤ8から映像データの送信準備が完了した旨の「ACK」信号を受け取ったとき、第2のAV接続装置5は、RTSPの「OK」コマンドデータ(「RTSP/1.0 200 2 OK Session:1234」)を第1のAV接続装置4に送信する(ステップS4511～ステップS4512)。

【0394】その後、第2のAV接続装置5は、この同期チャネルを通して送られてきた映像データをIPカプセル化し、IPパケットとして第1のAV接続装置4に対して送出する(ステップS4513～4515)。

【0395】第1のAV接続装置4は、IPパケットとして上記映像データを受信し、映像の表示など必要な処理を行う。映像の送出先をデジタルTV7とする場合は、第1の実施形態と同様に、第1の家庭内ネットワークであるIEEE1394上における必要な同期チャネルの確保や、第1のAV接続装置4がデジタルTV7に対して、該同期チャネルからのデータ受信及びそのデータの画面への表示を指示した後、上記映像データを受信IPパケットから取り出し、IEEE1394向けのフォーマットに変換した後、第1の家庭内ネットワークに送出すればよい。

【0396】なお、ユーザが、図39のホームページの「電源ON」のアイコンi201をクリックする前に「再生」のアイコンi206をクリックした場合でも、そのユーザはDVDプレーヤ8の操作の意志があると判断して、「再生」のアイコンi206のクリックに呼応して、「SETUP」コマンドと、「PLAY」コマンドの両方を送出するようになっていても良い。

【0397】また、DVDプレーヤのホームページを開く時点で、RTSPコマンドとして、DVDプレーヤの「SETUP」コマンドを送出するようになっていても良い。

【0398】以上説明したように、第2の家庭内ネットワークに收容される遠隔制御可能な全てのサービス提供装置から収集されたサービス情報に基づき第2のAV接続装置5は、RTSPコマンド対応テーブル1410を参照して各サービス提供装置のRTSPコマンドとリン

クされたアイコンを掲載するホームページを作成し、このホームページにアクセスした第1のAV接続装置4側で所望のアイコンがクリックされたとき、そのアイコンにハイパーリンクによって対応付けられた(HTTP/RTSP処理機能1409の1394/IPコマンド変換機能1423のテーブルに登録されている)RTSPコマンドが、1394AV/Cコマンドに変換されて所望のサービス提供装置に対し所望の制御を実行することにより、第2の物理ネットワーク(例えばIEEE1394バス3)に接続されたサービス提供装置(例えばDVDプレーヤ8)がデータリンクレイヤに依存するプロトコルしか解釈できない場合でも(本発明のAV接続装置を用いれば)遠隔制御が可能となる。

【0399】さて、以上は第2のAV接続装置5が映像データをIPパケットにカプセル化して送出する場合について説明した。これに対して、第2のAV接続装置5が、IPカプセル化を行わず、非IPデータのまま第1のAV接続装置4に対して映像データを送出する方法も考えられる。この場合について図43に示すシーケンスを参照して説明する。

【0400】ステップS4801～ステップS4802の第1のAV接続装置4のユーザは、DVDプレーヤのホームページを受け取り、DVDプレーヤの遠隔操作を始めるまでは、図40の説明と同様である。

【0401】例えば、図39のホームページの「電源ON」のアイコンi201をクリックしたとする(ステップS4803)。「電源ON」のアイコンi201には、例えば、RTSPの「SETUP」コマンドがハイパーリンクにより対応づけられている。よって、「SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport:ieci883/nonip;port=FANP」というRTSPの「SETUP」コマンドデータが第1のAV接続装置4から第2の接続装置5に送信される(ステップS4804)。このコマンドデータにより、第1のAV制御装置4は、データをIEC1883でカプセル化し、IPパケットではない形で送信することを要求している(すなわち、RTSPの「SETUP」コマンドには非IPパケット化を指示するための「ieci883/nonip」という情報を含んでいる)。また、送信されるデータのリンクレイヤ情報と、属性情報を知るために、第2のAV接続装置5に対して、FANPを用いて、上記情報を第1のAV接続装置4に通知することを要求している。

【0402】RTSPの「SETUP」コマンドデータは、第2のAV接続装置5のHTTP/RTSP処理機能1409で受け取られ、HTTP/RTSP主処理機能1421に到達する。

【0403】HTTP/RTSP主処理機能1421では、ポート番号「2000」は、1394ノードである

DVDプレーヤ8に割り当てられている番号である事を認識し、RTSP代理機能1422に制御が渡される。

【0404】RTSP代理機能1422は、1394/IPコマンド変換機能1423内のテーブルを参照して、対応する1394AV/Cコマンド（本実施形態の場合、電源オンを意味するAV/Cコマンド）を見つけ、該当する1394ノード（本実施形態の場合、DVDプレーヤ8）に対して、1394AVコマンド処理機能1408を通して、上記AV/Cコマンドを発行する（ステップS4805）。

【0405】これに成功すると、第2のAV接続装置5は、第1のAV接続装置4に対して、制御完了を意味するRTSPの「OK」コマンドデータ（例えば、「RTSP/1.0 200 1 OK Session: 1234」）を送出する（ステップS4806）。その際に、RTSPコマンドには、このセッションを通して一意の番号として、セッション番号（本実施形態の場合、「1234」）を付加している。第1のAV接続装置4のブラウザは、このセッション番号を保持し、以下同一の装置に対してRTSPコマンドを発行する場合、セッション番号「1234」をコマンドに付加する。ブラウザが保持するセッション番号は、ユーザによる明示的なセッションの終了、例えばセッション終了に対応するハイパーリンクの参照、または対向側の第2のAV接続装置5によるセッションの終了、もしくはページのリロードによっても更新される。

【0406】次に、ユーザは、図39のホームページの「再生」のアイコンi206をクリックしたとする（ステップS4807）。「再生」のアイコンi206には、例えば、RTSPの「PLAY」コマンドがハイパーリンクにより対応づけられている。よって、このハイパーリンクによって対応づけられた第2のAV接続装置5（IPアドレス「192.168.1.254」、ポート番号「2000」、セッション番号「1234」）に対して、「PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session: 1234」というコマンドデータが第1のAV接続装置4から送信される（ステップS4808）。

【0407】これを受信した第2のAV接続装置5は、DVDプレーヤ8の再生を促すべく、IEC1883による同期チャンネルの確保（#X）、1394AV/CプロトコルのDVDプレーヤに対する「PLAY」コマンドの実行を行い、映像データの上記確保した同期チャンネルに対する送出を促す（ステップS4809～S4811）。そして、DVDプレーヤ8から映像データの送信準備が完了した旨の「ACK」信号を受け取ったとき、第2のAV接続装置5は、RTSPの「OK」コマンドデータ（「RTSP/1.0 200 2 OK Session: 1234」）を第1のAV接続装置4に

送信する（ステップS4811～ステップS4812）。

【0408】その後、第2のAV接続装置5は、この同期チャンネル（#X）を通して送られてきた映像データを、IPカプセル化は行わず、そのまま公衆網のカプセル化をして、第1のAV接続装置4に対して送出する。例えば、公衆網がATM網であれば、第2のAV接続装置5に伝送されてきたIEC1883パケットをそのままATM網にマッピングして送出してもよいし、IEC1883パケットを一度外し、映像データそのものをATM網にマッピングして送出してもよい。いずれにしても、第2のAV接続装置5が送出するリンクレイヤのヘッダ情報を第1のAV接続装置4に対して通知するため、FANPメッセージ「FANP message (ch: #y, Session: 1234)」を送出する（ステップS4813）。

【0409】FANPメッセージの使い方は、基本的に第1の実施形態と同様であるが、ステップS4812において通知されたセッション番号に対応するFANPであることを明確にするために、このFANPメッセージにはステップS4812にて通知された値と同一の値のセッション番号（本実施形態の場合「1234」）が含まれても良い。この様にすることにより、受信側ノードすなわち第1のAV接続装置4は、FANPメッセージが前記RTSPの「PLAY」コマンドに対応するものであることを認識する事ができる。

【0410】さて、第2のAV接続装置5では、DVDプレーヤ8から同期チャンネル（#X）で送られてきた映像データをIPカプセル化せずに公衆網2に出力すると、それを受信した第1のAV接続装置4では、映像の表示など必要な処理を行う（ステップS4814～S4816）。その際、ステップS4815にあるように、例えば、MPEGover1394からMPEGoverATM等、伝送されるネットワークに依存するデータ伝送方法が規定されている場合は、必要なフォーマット変換を行っても良い。また、映像の送出先をデジタルTV7とする場合も前述の場合と同様である。

【0411】以上の第4の実施形態では、ホームページ中のアイコンあるいは文字列にサービス提供装置を遠隔制御するためのRTSPコマンドをハイパーリンクにて対応させる場合について説明してきたが、ハイパーリンクにて対応させる代わりに各RTSPコマンドに対応するホームページ中のアイコンあるいは文字列のそれぞれに、対応するRTSPコマンドデータを作成するためのプログラム（例えばJAVA（登録商標）プログラム）を張り付け、そのアイコンあるいは文字列がクリックされた場合は、該プログラムを第1のAV接続装置4（例えば、第1のAV接続装置4上のJAVA仮想マシン）にて起動して、図40や図43で説明したようなRTSPコマンドが送出されるようになっていてもよい。

【0412】この場合の処理動作は、図40、図43と同様であり、異なるのは、例えば図40のステップS4504、図43のステップS4802で第2のAV接続装置5から送信されるサービス提供装置のホームページのテキスト記述である。

【0413】サービス提供装置のホームページのテキストの一例を図44に示す。図44には、DVDプレーヤのホームページのテキストで、例えば、図39の「再生」のアイコンi206にRTSPコマンドを生成するプログラムが付加されている。

【0414】やはり、この場合も、「再生」のアイコンi206をクリックすれば、RTSPの「PLAY」コマンドを生成するプログラムを起動することにより、そのコマンドを所望のノードの所望のポートに送出することができるようになり、もってRTSPを使ったサービス提供装置を遠隔制御することができる。

【0415】次に、図39のホームページの「詳細設定」のアイコン(ボタン)i210について説明する。このボタンは、RTSPコマンドにて予め定められた遠隔制御よりも細かな操作を対象のサービス提供装置(例えば、DVDプレーヤ8)に対して行いたい場合に用いるものである。即ち、IEEE1394のAV/Cプロトコルにて規定されるDVDプレーヤ8の制御コマンドは、RTSPで規定されるコマンドよりも多岐にわたる可能性がある。このように、RTSPコマンドにて、1394AV/Cのすべてのコマンドに対応できない場合の対策として、これを行うホームページを別途設け、図39の「詳細設定」のボタンを押すと、それに対応付けられた、例えば「GET /appliances/dvd\_detail.html HTTP/1.1」というコマンドが送出されて、図47に示すようなDVDプレーヤの詳細設定のためのホームページが送付される。

【0416】図45は、サービス提供装置の詳細設定のためのホームページの作成処理手順を示したものである。すなわち、前述の各サービス提供装置毎のコマンドテーブル1410にて対応がなされていない、そのサービス提供装置のリンクレイヤ方式(本実施形態の場合、IEEE1394のAV/Cプロトコル)に依存したコマンド(ネイティブコマンド)を登録したネイティブコマンド対応テーブルを別途1394/IPサービスロケーション処理機能1406に具備している。各サービス提供装置毎にネイティブコマンドテーブルを参照してネイティブコマンドを取得し(ステップS121)、各コマンド毎にそれに対応するアイコンあるいは文字列を作成する(ステップS122)。生成されたアイコンあるいは文字列にはCGI(Common Gateway Interface)スクリプトを対応付ける(ステップS123)。以上をそのサービス提供装置のネイティブコマンドの全てに対し行い、作成されたアイコンあ

るいは文字列を適当に配置して、例えば図47に示すようなサービス提供装置の詳細設定のためのホームページを作成する(ステップS124～ステップS125)。

【0417】なお、ネイティブコマンド対応テーブルは、図42に示したHTTP/RTSP処理機能に具備されているCGI処理機能1424内のテーブルと同様ののものであっても良い。

【0418】図47のDVDプレーヤの詳細設定のためのホームページに配置されたボタン(アイコンあるいは文字列)の一部は、第2のAV接続装置5内のCGI(Common Gateway Interface)処理機能により処理されるCGIスクリプトに対応付けられている。そして、おのこのCGIスクリプトが、対応するIEEE1394のAV/Cコマンドを、第2の家庭内ネットワークのIEEE1394バスに対して送出するようなスクリプトとなっており、もって、上記アイコンあるいは文字列をクリックすればAV/Cプロトコルで定められた粒度の制御が行えるようになる。

【0419】このようにして、詳細設定のためのホームページを作成し、そのホームページ内のアイコンあるいは文字列をクリックされると、それに対応付けられた第2のAV接続装置5内のCGIスクリプトを起動するための要求メッセージがHTTPにて送信され、それを受けて第2のAV接続装置5では、該CGIスクリプトを起動し、対応するAV/Cコマンドが発行される。

【0420】図46は、第2のAV接続装置5から送信される例えばDVDプレーヤの詳細設定のためのホームページのテキスト記述の一例を示したもので、図47の「スロー再生」の文字列にCGIスクリプトを対応付けている場合を示している。

【0421】図47のDVDプレーヤの詳細設定のためのホームページで「通常再生」を選択すると、前述の図40のステップS4508同様にRTSPコマンドが発行されるが、「言語選択」や「スロー再生」などのRTSPでサポートされていないコマンドについては、第2のAV接続装置5のHTTP/RTSP処理機能に具備されたCGI処理機能1424において、該当するCGIスクリプトを起動し、対応するAV/Cコマンドを1394AVコマンド処理機能1408を通して発行する。

【0422】例えば、図47に示すホームページで「スロー再生」を選択した場合、これに対応するCGIスクリプトを起動するためのメッセージ「GET http://192.168.1.254/dvd/slowplay.cgi HTTP/1.1」を第2のAV接続装置5に向けて送出する。これを受信した第2のAV接続装置5では、「スロー再生」のコマンドはRTSPでサポートされていないので、HTTP/RTSP処理機能に具備されたCGI処理機能1424において、

該当するCGIスクリプトを起動し、対応するAV/Cコマンドを1394AVコマンド処理機能1408を通して発行する。

【0423】サービス提供装置の詳細設定のためのホームページには、RTSPコマンドに対応するアイコンあるいは文字列と、CGIスクリプトに対応するアイコンあるいは文字列とが混在していてもよいし、また、そのホームページがCGIスクリプトに対応するアイコンあるいは文字列とでのみ構成されていてももちろん良い。例えば、図47の「再生」ボタンや「電源ON」、「電源OFF」のボタンなど、RTSPコマンド対応テーブルにあるコマンドについては、ハイパーリンクなり、J

AVAプログラム等により実現されていてもよく、「選択言語」、「字幕」といった、その他の詳細コマンドについてはCGIにて実現されていてもよい。

【0424】また、図47の詳細設定のためのホームページに配置されている全てのボタンは、ネイティブコマンド対応テーブルに登録されていて、CGIスクリプトに対応つけられていてもよい。

【0425】以上、第4の実施形態では、IEEE1394バス上のAV/Cコマンドに従うAV機器の遠隔制御について述べてきたが、同様の制御はその他の任意のリンクレイヤに依存するプロトコル群を有する機器についても同様に行うことができる。その一例として、ホームオートメーション網の一種であるLONを適用する場合について説明する。

【0426】図48、図49は、それぞれLONを接続するAV接続装置の内部構成例、HTTP/RTSP処理機能の構成例を示したものである。

【0427】IEEE1394のAV/Cコマンドの代わりに、LONで定められたコマンド群、例えばLONTalk等のコマンド群を送出できるようになっている点が、差点であり、その他の各構成部は、前述同様である。

【0428】なお、以上第4の実施形態で説明した各機能は、ソフトウェアとしても実現可能である。また、上記した各手順あるいは手段をコンピュータに実行させるためのプログラムを記録した機械読取り可能な媒体として実施することもできる。

【0429】本発明は、上述した実施の形態に限定されるものではなく、その技術的範囲において種々変形して実施することができる。

【0430】(第5の実施形態)図51は、本発明の第5の実施形態に係る通信システムの構成例を示したもので、第1のネットワーク(例えばIEEE1394バスで構成されるホームネットワーク)2010および第2のネットワーク(例えば公衆網2101上のインターネット)が、AV接続装置2201を介して相互接続されている。以下、第1のネットワーク2010をホームネットワーク2010、第2のネットワーク2101をイ

ンターネット2101と呼ぶ。また、ホームネットワーク2010に接続されている各端末装置はインターネット処理機能をもつ情報家電であるとする。

【0431】AV接続装置2201は、ホームネットワーク2010とインターネット2101とを接続するゲートウェイの役割を持ち、後述するように、ホームネットワークやインターネットの終端機能、ルータ機能、プロトコル変換機能、代理サーバ機能などを持つ。

【0432】ホームネットワーク2010を構成するIEEE1394バスには、パーソナルコンピュータ(PC)2001、プリンタ2002、DVDプレーヤ2003が接続されている。インターネット2101には、IP通信を行うことのできるIP端末2102が接続されている。もちろん、上記以外の端末装置がホームネットワーク2010、インターネット2101に接続されていてもよい。

【0433】図51において、全ての端末装置はインターネット端末、即ちIPアドレスを持ち、IP通信を行うことができる端末装置である。ただし、ホームネットワーク2010を構成するIEEE1394バスは、プライベートIPアドレス空間のアドレスで運用されており、インターネット2102はグローバルIPアドレス(例えばIPv4)空間で運用されている。IP端末2101のIPアドレスは「G. 2」であるとする。一方、ホームネットワーク2010上の各装置のアドレスとしては、プライベートサブネットアドレス「P. 0」を持ち、PC2001が「P. 1」、プリンタ2002が「P. 2」、DVDプレーヤ2003が「P. 3」であるとする。

【0434】AV接続装置2201は、アドレス体系の異なるこれら2つのネットワークに接続されているので、2つの異なるアドレス体系のアドレスを有する。すなわち、ホームネットワーク2010側のIPアドレスが「P. 254」で、インターネット2101側のIPアドレスが「G. 1」であるとする。

【0435】図52は、AV接続装置2201の構成例を示したものである。AV接続装置2201は、ホームネットワーク2010を構成するIEEE1394バスと接続するためのインタフェースを司る1394インタフェース(I/F)2202、インターネット2101と接続するためのインタフェースを司るインターネットインタフェース(I/F)2205、インターネットパケットのルーティング処理や、グローバルIPアドレスとプライベートIPアドレスとの間のアドレス変換等を行うIP処理部2202、ホームネットワーク2010内のサービスを検出、収集し、これらサービスをインターネット2101側に対してホームページ処理部2204を通じて提示(広告)するサービスロケーション代理処理部2203、ホームネットワーク2010上の装置、サービスについて、インターネット2101側からの遠

隔制御を行うことができるようなホームページを生成し、これを要求に応じて配送するホームページ処理部2204から構成される。

【0436】IP処理部2202は、アドレス変換処理を行うNAT処理部2206を具備する。NATとはネットワークアドレス変換（トランスレーション）の略であり、一般にグローバルIPアドレスとプライベートIPアドレスとの間の変換処理、あるいはIPv4アドレスとIPv6アドレスとの変換処理等を行う。詳細は、RFC1631を参照されたい。

【0437】NAT処理部2206は、IPマスカレードと呼ぶポート単位 of アドレス変換機能もある。即ち、ホームネットワーク2010側にいくつもの端末装置があったとしても、インターネット2101側に必要なグローバルIPアドレスが1つ（本実施形態の場合「G.1」）あれば十分とする技術であり、具体的には、ホームネットワーク2101に接続されている各々の端末装置、各々のサービス（例えばRFC1340で規定されているポート番号にて識別されるサービス）の論理多重識別子（RFC1340で規定されているポート番号にて識別されるサービスの論理多重識別子はポート番号である）に対して、同一のグローバルIPアドレス「G.1」と、各サービス毎に別々の他の論理多重識別子（例えばRFC1340で規定されているポート番号）を割当て、これらの対応関係を図55に示すようなテーブル（アドレス・ポート番号変換テーブル2207）として記憶する。そして、インターネット2101およびホームネットワーク2010のいずれか一方から他方へ転送されるパケットの宛先アドレスは、このテーブル2207を用いて、互いのアドレス空間のアドレス及びポート番号に変換されて転送されることにより、インターネット2101上の端末装置とホームネットワーク2010上の装置とが互いに通信可能となる。

【0438】IP処理部2202は、さらに、パケットフィルタ2208を具備する。パケットフィルタ2208は、いわゆるファイアウォールとしての機能を有する。即ち、AV接続装置2201を通過すべきでないパケット（あるいは通過してもよいパケット）を判別し、通過すべきでないパケットについてはこれをIP処理部2202以外の他の部位に渡さないようにして（例えば廃棄する）、外部からホームネットワーク2010へのアクセスを制限する。これにより、悪意のユーザによるホームネットワーク2010上のサービスへのアクセスを未然に防止するようになっている。この判断処理のために、パケットフィルタ2208は、例えば、AV接続装置2201を通過してホームネットワーク2010へ送出可能なパケットのソースアドレスを登録したテーブル（パケットフィルタテーブル2209）を持ち、インターネット2101から入力されるパケットのソースアドレスが、このテーブルに登録されている時にその通過

を許可する。なお、パケットフィルタテーブル2209にはAV接続装置2201を通過させないソースアドレスが登録されていてもよい。この場合、インターネット2101から入力されるパケットのソースアドレスが、このテーブルに登録されていなければ、そのパケットの通過を許可する。

【0439】次に、図53に示すシーケンスを参照して、インターネット2101上のIP端末2102から、ホームネットワーク2010にアクセスし、例えばDVDプレーヤ2003の遠隔操作を行う場合を例にとり、AV接続装置2201の処理動作について説明する。

【0440】まず、AV接続装置2201のサービスロケーション代理処理部2203は、ホームネットワーク2010上のサービスロケーション情報を収集する（ステップS5001～ステップS5003）。サービスロケーション情報とは、ホームネットワーク2010上にどのようなサービスあるいは端末装置が存在しているかを示す情報である。サービスロケーション情報の収集を行う方法としては、いくつかの方法が考えられる。例えば、サービスロケーションプロトコルを用いる方法、LDAP（ライトウエイトディレクトリアクセスプロトコル）を用いる方法、DHCP（ダイナミックホストコンフィグレーションプロトコル）を用いる方法、SNMP（シンプル網管理プロトコル）のMIB（マネージメントインフォメーションベース）を用いる方法など、種々の方法が考えられるが、これらのいずれの方法を用いても良い。

【0441】ここでは、例えば、図12に示したようなサービスロケーションプロトコルを用いて、ホームネットワーク2010上のサービスロケーション情報を収集するものとする。なお、サービスロケーションプロトコルの詳細はRFC2165を参照されたい。実際のサービスロケーション情報の収集は、図53のように、AV接続装置2201がホームネットワーク2010のディレクトリエージェントとなっており、各サービスエージェント（即ちPC2001、プリンタ2002、DVDプレーヤ2003）からAV接続装置2201へ、それぞれのサービスの登録を行うものであってもよい。

【0442】なお、このような方法以外にも、AV接続装置2201がサポート可能なサービスについて、それぞれのサービスにあらかじめ割当てられたIPマルチキャストアドレスに対して、AV接続装置2201がサービス要求を送出し、この要求に対し、当該サービスを提供する端末装置自身が答えるようにしてもよい。また、AV接続装置2210がホームネットワーク2010上に別個存在するディレクトリエージェントに、ホームネットワーク2010上のサービスの詳細を問い合わせるようにしてもよい。

【0443】ここで収集されたホームネットワーク20

10上で提供されているサービスに関する情報（より具体的には、ホームネットワーク2010上の端末装置のアドレスと当該装置により提供されるサービスのポート番号（RFC1340で規定））を基に、図54のフローチャートに示すような処理動作を行う。

【0444】AV接続装置2201は、ホームネットワーク2010の所有者（例えばAさんとする）宅にどのようなサービスや端末装置が存在するのかを説明するホームページをホームページ処理部2204にて作成する（ステップS5101～ステップS5102）。

【0445】このホームページは、例えば、図59に示すようなもので、インターネット2101上の任意の端末装置から、Aさん宅のURL（Uniform Resource Locator）、すなわち、例えば「http://G.1」にアクセスすると表示されるホームページである。このホームページから、例えば、CGI（Common Gate Way）プログラムにより、Aさん宅に存在している各サービスや端末装置を操作することができるようなユーザインタフェースである。実際には、このホームページから、ホームネットワーク2010上の各端末装置に対してリンクが張られており、そのオブジェクトをクリックすると、次には各端末装置のホームページに接続され、各端末装置が提供する、その端末装置の操作スイッチ等を遠隔操作することが可能となるホームページが表示される仕組みになっている。

【0446】次に、サービスロケーション代理処理部2203は、先に収集されたサービス、あるいは端末装置のそれぞれについて、独自の論理多重識別子、すなわち、例えば、RFC1340で規定されているポート番号（ウエルノウンポート番号ではなく、動的に設定可能なポート番号）を割り当てていく（ステップS5104）。以下、ホームネットワーク2010上でもともと定められているポート番号を第1のポート番号と呼び、ホームネットワーク2010上のサービスに対しサービスロケーション代理処理部2203で独自に割り当てられるポート番号を、ホームネットワーク2010上でもともと定められているポート番号とは区別するために第2のポート番号と呼ぶ。

【0447】例えば、第2のポート番号「2000」はDVDプレーヤ2003に、第2のポート番号「2002」はプリンタ2002、第2のポート番号「2004」はPC2001と言うように割り当てていく。この第2のポート番号は、AV接続装置2201のグローバルIPアドレスと組になり、運用される。即ち、インターネット2101側より、例えば第2のポート番号「2000」がアクセスされた場合、AV接続装置2201は、これはDVDプレーヤ2003に対するアクセスであると解釈していくこととなる。なお、論理多重識別子は、RFC1340で規定されているポート番号に限ら

ず、ホームネットワーク2010上で提供される各サービスをインターネット上で識別できる識別子であれば何でもよい。

【0448】AV接続装置2201のグローバルユニークIPアドレスと、ホームネットワーク2010上で提供される各サービスに割り当てられた第2のポート番号と、ホームネットワーク2010上の当該サービスに対する論理多重識別子としての第1のポート番号と、当該サービスを提供する装置のプライベートIPアドレスとの対応関係は、アドレス・ポート番号対応テーブル2207に登録される（ステップS5105）。

【0449】アドレス・ポート番号対応テーブル2207の具体例を図55に示す。アドレス・ポート番号対応テーブル2207には、ホームネットワーク2010上で提供される各サービス毎に、インターネット2101側のIPアドレス（グローバルユニークIPアドレス）と第2のポート番号、ホームネットワーク2010側のIPアドレス（プライベートIPアドレス）と第1のポート番号の対が登録されている。このテーブル2207に、ホームネットワーク2010上で提供される全てのサービスについての対応関係が順次登録されていく。

【0450】例えば、DVDプレーヤ2003の場合、ホームネットワーク2010内でのDVDプレーヤのサービス（IPアドレス（プライベートIPアドレス）＝P.3、第1のポート番号＝80でDVDプレーヤにより提供されるhttpサービスであると、サービスロケーションプロトコルにより解釈される）には、インターネット2101側に対しては、AV接続装置2201のグローバルIPアドレス「G.1」で第2のポート番号「2000」が割り当てられている。

【0451】このようなアドレス・ポート番号変換テーブル2207の作成が、Aさん宅のサービスの各々について行われる。この各々について、Aさん宅のホームページへの記述が行われる。

【0452】Aさん宅の全てのサービスについて、テーブル2207への登録が終わった時点で、アドレス・ポート番号変換テーブル2207の作成、及びAさん宅のホームページの作成が終了する（ステップS5106）。

【0453】さて、作成されたアドレス・ポート番号変換テーブル2207は、AV接続装置2201内をIPパケットが通過する際、IPアドレスとポート番号の変換処理を行う際に用いられる。図58を参照して、アドレス・ポート番号変換テーブル2207を用いた、IPアドレスとポート番号の変換処理について具体的に説明する。例えばインターネット2101側から宛先IPアドレスが「G.1」、宛先ポート番号が「2000」であるようなIPパケットは、テーブル2207を参照することにより、宛先IPアドレスが「P.3」、宛先ポート番号が「80」であるようなIPパケットに変換さ

れて、ホームネットワーク2010側に送出される。逆に、ホームネットワーク110側から送信元IPアドレスが「P. 3」、送信元ポート番号が「80」であるようなIPパケットは、送信元IPアドレスが「G. 1」、送信元ポート番号が「2000」であるようなIPパケットに変換されて、インターネット2101に送出される。

【0454】さて、このようなアドレス・ポート番号変換テーブル2207、及びAさん宅のホームページの作成を終了したAV接続装置2201は、このホームページをAさん宅のホームページとしてインターネット2101上に公開する(図59参照)。

【0455】次に、インターネット2101上のIP端末2102のユーザが、Aさん宅のDVDプレーヤ2003の遠隔操作を行う場合について説明する。

【0456】インターネット2101側からIPパケットを受信した場合のAV接続装置2210の処理動作を図56に、ホームネットワーク2010側からIPパケットを受信した場合のAV接続装置2201の処理動作を図57に示す。以下、図53と図56～図57に示すフローチャートを参照して説明する。

【0457】まず、IP端末2102はAV接続装置2201に対して、Aさん宅のホームページの送付を要求するため、認証手続きを行う(図53のステップS5004)。例えばIP端末2102のユーザに対して、パスワード入力等を要求し、これにより認証されたユーザについてのみ、そのIP端末2102のIPアドレスを前述のパケットフィルタテーブル2209に登録する。

【0458】パケットフィルタテーブル2209は、単にIPアドレスが羅列してあるのみのテーブルで、このテーブルに登録されているIPアドレスのみがホームネットワーク2010、およびホームネットワーク2010上で提供されるサービスへのアクセスが可能となる。

【0459】次に、IP端末2102は、AV接続装置104に対して、Aさん宅のホームページの送付を要求する(ステップS5005)。パケットフィルタ2208で当該ホームページの送付要求のパケットのソースアドレスがパケットフィルタテーブル2209に登録されているか否かをチェックし(ステップS5006)、当該ソースアドレスがパケットフィルタテーブル2209に登録されている場合に限り、当該パケットはホームページ処理部2204に渡され、当該要求に応じて、ホームページ処理部2204は、IP端末2102に対して、Aさん宅のホームページの送付を行う(ステップS5007)。

【0460】ここで送付されるホームページには、図59に示したように、ホームネットワーク2010上のDVDプレーヤ2003、プリンタ2002、PC2001のそれぞれのホームページへのリンクが付いている。例えば、図59のホームページ上の「DVDプレーヤ」

という文字あるいは絵にはDVDプレーヤ2003へリンクされている。実際のリンク先のアドレスはAV接続装置2201のグローバルIPアドレス「G. 1」の第2のポート番号「2000」となっており、形式上は、AV接続装置2201がホームネットワーク2010上の装置へアクセスするための代理サーバとなっている。これは、もちろん、IP端末2102からは認識されていない。しかしながら、代理サーバ処理とは違い、実際にAV接続装置2201が行う処理は、後述のようにIPマスカレード処理、即ちIPアドレスとポート番号の変換処理である。

【0461】さて、IP端末2102のユーザは、DVDプレーヤ2003の遠隔操作をするべく、DVDプレーヤのホームページの送出要求を送出する。例えば、図59に示したホームページ上の「DVDプレーヤ」という文字あるいは絵をクリックすることにより、DVDプレーヤのホームページの送出要求のIPパケットが送出される。このパケットの宛先は、宛先IPアドレスが「G. 1」、宛先ポート番号が「2000」である(ステップS5008)。

【0462】このIPパケットをAV接続装置2201が受信したときの処理動作、すなわち、図53のステップS5009～ステップS5010までのパケットフィルタリング及びアドレス・ポート番号変換処理について図56に示すフローチャートを参照して説明する。

【0463】AV接続装置2201は、受信したIPパケットの宛先アドレスを参照して自分宛てであることを確認すると(ステップS5201)、まず、パケットフィルタテーブル2209を参照してパケットフィルタリング処理を行う(ステップS5202)。当該パケットのソースアドレスがパケットフィルタテーブル2209に登録されていれば、次に、当該パケットの宛先IPアドレスと宛先ポート番号との組がアドレス・ポート番号変換テーブル2207に登録されているか否かをチェックする(ステップS5203)。登録されていれば、アドレス・ポート番号変換テーブル2207に従って、当該宛先IPアドレス及び宛先ポート番号を、対応するホームネットワーク側のIPアドレス(プライベートIPアドレス)及び第1のポート番号に差し替え(ステップS5204)、ホームネットワーク2010へ当該IPパケットを送出する(ステップS5205)。この様に、グローバルIPアドレスおよび第2のポート番号から、プライベートアドレスおよび第1のポート番号へのアドレス変換が行われる。

【0464】なお、アドレス・ポート番号変換テーブル2207に登録されておらず、かつAV接続装置2201自身宛てのパケットでない場合は、そのパケットは廃棄する(ステップS5206)。

【0465】図53の説明に戻り、アドレス・ポート番号変換処理(IPマスカレード処理)が施されて、ホー

ムネットワーク2010側へ送出されたIPパケットは、DVDプレーヤ2003に到達し（ステップS5011）、DVDプレーヤ2003はIP端末2102のグローバルIPアドレスを宛先アドレスとしてDVDプレーヤ2003のホームページを送付する。その際のIPパケットの送信元IPアドレスはプライベートIPアドレス「P. 3」、送信元ポート番号は第1のポート番号「80」である（ステップS5012）。

【0466】DVDプレーヤ2003のホームページを含むIPパケットをホームネットワーク2010側から受信したときのAV接続装置2201の処理動作、すなわち、図53のステップS5013のアドレス・ポート番号変換処理動作について図57に示すフローチャートを参照して説明する。

【0467】AV接続装置2201は、受信したIPパケットの送信元アドレスとポート番号との組がアドレス・ポート番号変換テーブル2207に登録されているかどうかをチェックする（ステップS5301～ステップS5302）。登録されていれば、アドレス・ポート番号変換テーブル2207に従って、当該宛先IPアドレス及び宛先ポート番号を、対応するインターネット側のIPアドレス（グローバルユニークIPアドレス）及び第2のポート番号に差し替えてから（ステップS5303）、当該IPパケットをインターネット2101へ送出する（ステップS5304）。なお、ステップS5303において、アドレス・ポート番号変換テーブル2207に登録されていなかったときは、通常のIPマスカレード処理を行う（ステップS5305）。すなわち、ソースアドレスとポート番号との組を新たにアドレス・ポート番号変換テーブルに登録し、以降のIPマスカレード通信に備える。

【0468】図53の説明に戻り、アドレス・ポート番号変換処理（IPマスカレード処理）が施されて、インターネット2101側へ送出されたIPパケットは、IP端末2102に到達し（ステップS5014）、IP端末2102にDVDプレーヤ2003のホームページが表示され、この画面を使って、IP端末2102のユーザはDVDプレーヤ2003の遠隔操作を行うことになる。

【0469】この遠隔操作は、たとえば、DVDプレーヤ2003の再生動作の開始等をIP端末2105とDVDプレーヤ2003との間でCGIプログラムによる要求とその処理結果をIPパケットでやり取りして行われるが、その際、当然ながら図53のステップS5010、ステップS5013の様なIPマスカレード処理が行われる。

【0470】この間、IP端末2102は、自分がプライベートアドレス空間のノード（具体的にはプライベートIPアドレスを持ったDVDプレーヤ2003）と通信をしているという認識はない。このように、サービス

の紹介とアドレス変換処理（IPマスカレード処理）とを一体として扱うことにより、グローバルユニークIPアドレス空間からプライベートIPアドレス空間中で提供されるサービスへのアクセスを可能としている。

【0471】なお、本実施形態においては、第2のネットワークとしてグローバルIPアドレス空間を持つインターネット2101、第1のネットワークとしてプライベートIPアドレス空間を持つホームネットワーク2010との間におけるAV接続装置2201によるアドレス・ポート番号変換処理を説明してきたが、当然ながら、第1および第2のネットワークは、以下のような組み合わせのいずれも可能である。

【0472】（1）グローバルIPアドレスと、プライベートIPアドレスとの組み合わせ

（2）IPv4アドレスと、IPv6アドレスとの組み合わせ

（3）IPv6アドレスと、リンクローカルIPv6アドレスとの組み合わせ

例えば、第2のネットワークとしてIPv4アドレスにて運用されるインターネット、第1のネットワークとしてIPv6アドレスにて運用されるインターネットとしても、本発明は適用が可能である。

【0473】また、第2のネットワークをIPv6アドレスにて運用されるインターネット、第1のネットワークとしてリンクローカルIPv6アドレスにて運用されるインターネットとしても、本発明は、そのまま適用が可能である。

【0474】また、上記実施形態においては、インターネット2102に対する、ホームネットワーク2010上のサービスの広告の方法として、AV接続装置2201上のホームページを使う方法について説明してきたが、このサービス広告の方法としては、上記方法以外に、LDAP（ライトウエイトディレクトリアクセスプロトコル）を用いる方法、DHCP（ダイナミックホストコンフィグレーションプロトコル）のコンフィグレーションオプションを用いる方法、SNMP（シンプル網管理プロトコル）のMIB（マネジメントインフォベース）のリモートアクセスを用いる方法など、種々の方法が考えられる。このサービス広告の方法として、これらのいずれの方法を用いてももちろん良い。

【0475】

【発明の効果】本発明によれば、特定のネットワークに依存せず、統一的なサービス提供環境を実現することが可能となる。

【0476】また、本発明によれば、OSやハードウェアに依存せず、必要の生じた時点で装置制御プログラムを登録することが可能となる。

【図面の簡単な説明】

【図1】本発明の第1の実施形態に係るネットワーク・システムの一構成例を示す図



【図 2】同実施形態に係る A V 接続装置の内部構成例を示す図

【図 3】端末／サービス収集のシーケンスの一例を示す図

【図 4】コンフィグレーション ROM に記述される内容の一例を示す図

【図 5】コンフィグレーション ROM に記述される内容の他の例を示す図

【図 6】コンフィグレーション ROM に記述される内容のさらに他の例を示す図

【図 7】サービス別の表示を行う場合の画面例を示す図

【図 8】端末別の表示を行う場合の画面例を示す図

【図 9】ディレクトリエージェントにサービス情報を登録する手順の一例を示す図

【図 10】ディレクトリエージェントに登録する情報の一例を示す図

【図 11】サービス別の表示を行う場合の画面例を示す図

【図 12】ディレクトリエージェントからサービス情報を入手する手順の一例を示す図

【図 13】ディレクトリエージェントから入手された情報の一例を示す図

【図 14】サービス別の表示を行う場合の画面例を示す図

【図 15】DVD プレーヤ操作のための画面例を示す図

【図 16】第 2 の家庭内 LAN 上から第 1 の家庭内 LAN 上のサービスを利用する場合におけるネットワーク上を流れるコマンド群、プロトコル群についてのシーケンスの一例を示す図

【図 17】コマンド変換について説明するための図

【図 18】第 2 の家庭内 LAN 上から第 1 の家庭内 LAN 上のサービスを利用する場合におけるネットワーク上を流れるコマンド群、プロトコル群についてのシーケンスの他の例を示す図

【図 19】第 2 の家庭内 LAN 上から第 1 の家庭内 LAN に接続された装置を制御する場合におけるネットワーク上を流れるコマンド群、プロトコル群についてのシーケンスの他の例を示す図

【図 20】コマンド変換について説明するための図

【図 21】本発明の第 2 の実施形態に係る PC の一構成例を示す図

【図 22】同実施形態に係るデバイスドライバのソフトウェア構成の一例を示す図

【図 23】論理デバイス管理オブジェクト初期化手順を示すフローチャート

【図 24】論理デバイスクラスオブジェクト初期化手順を示すフローチャート

【図 25】論理デバイスオブジェクト初期化手順を示すフローチャート

【図 26】物理デバイスオブジェクト初期化手順を示す

フローチャート

【図 27】不明のタイプを利用した場合におけるソフトウェア構造を説明するための図

【図 28】アプリケーションによる新規デバイスクラス追加要求手順を示すフローチャート

【図 29】論理デバイス管理オブジェクトによる新規デバイスクラス追加手順を示すフローチャート

【図 30】本発明の第 3 の実施形態に係る家庭内 LAN 間を接続したネットワーク・システムの構成例を示す図

10 【図 31】クライアント側の接続前におけるネットワーク経由サービスのソフトウェア構造を示す図

【図 32】クライアント側の接続後におけるネットワーク経由サービスのソフトウェア構造を示す図

【図 33】プロキシ側の接続前におけるネットワーク経由サービスのソフトウェア構造を示す図

【図 34】プロキシ側の接続後におけるネットワーク経由サービスのソフトウェア構造を示す図

【図 35】本発明の第 4 の実施形態に係る A V 接続装置の構成例を示した図

20 【図 36】第 2 の家庭内ネットワークに收容される全ての遠隔制御可能なサービス提供装置を提示したホームページの具体例を示した図

【図 37】図 36 に示したようなホームページの作成手順を説明するためのフローチャート

【図 38】サービス提供装置のホームページの作成手順を説明するためのフローチャート

【図 39】サービス提供装置（DVD プレーヤ）のホームページの具体例を示した図

30 【図 40】第 2 の家庭内ネットワークに收容されるサービス提供装置を遠隔制御する場合の処理動作を説明するためのシーケンス図（ホームページのアイコンと RTP コマンドが対応付けられ、さらに、送信データを IP カプセル化する場合）。

【図 41】送信されるホームページのテキストの一具体例を示した図。

【図 42】A V 接続装置の HTTP / RTP 処理機能の構成例を示した図

【図 43】第 2 の家庭内ネットワークに收容されるサービス提供装置を遠隔制御する場合の処理動作を説明するためのシーケンス図（ホームページのアイコンと RTP コマンドが対応付けられ、さらに、送信データを IP カプセル化しない場合）。

【図 44】サービス提供装置（DVD プレーヤ）のホームページのテキストの他の例を示した図（図 39 の「再生」のアイコンに RTP コマンドを生成するプログラムが付加されている場合）

【図 45】サービス提供装置の詳細設定のためのホームページの作成処理手順を示したフローチャート

50 【図 46】サービス提供装置（DVD プレーヤ）の詳細設定のためのホームページのテキスト記述の一例を示し

た図(図47の「スロー再生」の文字列にCGIスク립トを対応つけている場合)

【図47】サービス提供装置(DVDプレーヤ)の詳細設定のためのホームページの具体例を示した図

【図48】LONを接続するAV接続装置の内部構成例を示した図

【図49】図48のHTTP/RTSP処理機能の構成例を示した図

【図50】RTSPコマンド対応テーブルの一具体例を示した図

【図51】本発明の第5の実施形態に係る通信システムの構成例を示した図。

【図52】図51のAV接続装置の構成例を示した図。

【図53】インターネット上のIP端末からホームネットワークにアクセスして、DVDプレーヤの遠隔操作を行う場合の図51に示した通信システム全体のシーケンス図。

【図54】ホームネットワーク上で提供されているサービスに関する情報(ホームネットワーク上の端末装置のアドレスと当該装置により提供されるサービスのポート番号)を基にした、AV接続装置の処理動作を説明するためのフローチャート。

【図55】アドレス・ポート番号対応テーブルの具体例を示した図。

【図56】インターネット側からIPパケットを受信した場合のAV接続装置の処理動作を説明するためのフローチャート。

【図57】ホームネットワーク側からIPパケットを受信した場合のAV接続装置の処理動作を説明するためのフローチャート。

【図58】アドレス・ポート番号変換テーブルを用いた、IPアドレスとポート番号の変換処理を具体的に説明するための図。

【図59】AV接続装置にて作成される宅内ホームページの一例を示した図。

【符号の説明】

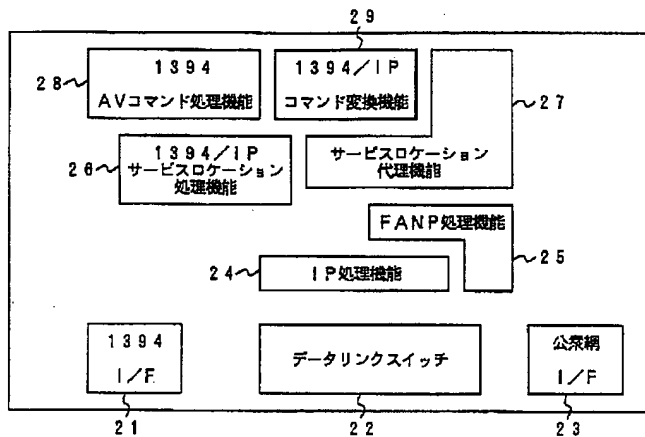
- 1、3…IEEE1394バス
- 2…公衆網
- 4、5…AV接続装置
- 6、10…PC
- 7…デジタルTV
- 8…DVDプレーヤ
- 9…デジタルVTR
- 11…プリンタ
- 12…ホームオートメーション網
- 13…エアコン
- 14…電子レンジ
- 21…1394インタフェース
- 22…データリンクスイッチ
- 23…公衆網インタフェース

- 24…IP処理機能
- 25…FANP処理機能
- 26…1394/IPサービスロケーション処理機能
- 27…サービスロケーション代理機能
- 28…1394AVコマンド処理機能
- 29…1394/IPコマンド変換機能
- 61、62…コマンド対応テーブル
- 71…サービス代理受信機能
- 72…CCCP/LONコマンド変換機能
- 73…LONコマンド発行機能
- 81、401、402…PC
- 82…プロセッサ
- 83…メインメモリ
- 84…システムバス
- 85…2次記憶装置
- 86、87…IEEE1394インタフェース
- 88…ハードディスク
- 90、431…プリンタ
- 91、432…FAX
- 92、433…マッサージ装置
- 93、434…トースタ
- 101、501、601…論理デバイス管理機能
- 102、502、602…2次記憶装置管理機能
- 103、503、603…1394インタフェース管理機能
- 104、604…プリンタのunit1
- 105、605…FAXのunit1
- 106、606…FAXのunit2
- 107、607…マッサージ装置のunit1
- 108、608…マッサージ装置のunit2
- 109、508…トースタのunit1
- 111、112、511、512、611、612…ハードディスク管理機能
- 113、114、513、514、613、614…IEEE1394インタフェースのデバイスドライバ
- 121、521、621…1394管理オブジェクト
- 122、522、622…論理デバイス管理オブジェクト
- 131～135、531～534、631～635…論理デバイスクラスオブジェクト
- 131-1、131-2、132-1、133-1、134-1～134-3、135-1、533-1、533-2、534-1、631-1、631-2、632-1、633-1、634-1、634-2、635-1、635-2…論理デバイスオブジェクト
- 151～156、551～153、651～155…物理デバイスオブジェクト
- 161～166、561～563、661～665…ドライバオブジェクト
- 411、412…ネットワーク接続装置

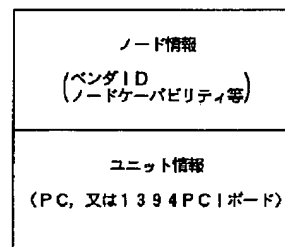
413…ISDN通信回線  
 421、422…1394バス  
 504…IP機能  
 571…1394スタブオブジェクト  
 681…1394プロキシオブジェクト  
 1401…1394I/F  
 1402…データリンクスイッチ  
 1403…公衆網I/F  
 1404…IP処理機能  
 1405…FANP処理機能  
 1406…1394/IPサービスロケーション処理機能

1407…ホームページ処理機能  
 1408…1394AVコマンド処理機能  
 1409…HTTP/RTSP処理機能  
 1410…RTSP対応テーブル  
 2001…パーソナルコンピュータ  
 2002…プリンタ  
 2003…DVDプレーヤ  
 2010…第1のネットワーク(ホームネットワーク)  
 2101…第2のネットワーク(インターネット)  
 2102…IP端末装置  
 2201…AV接続装置

【図2】



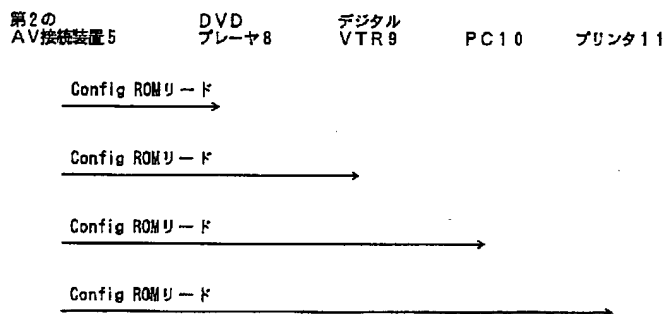
【図6】

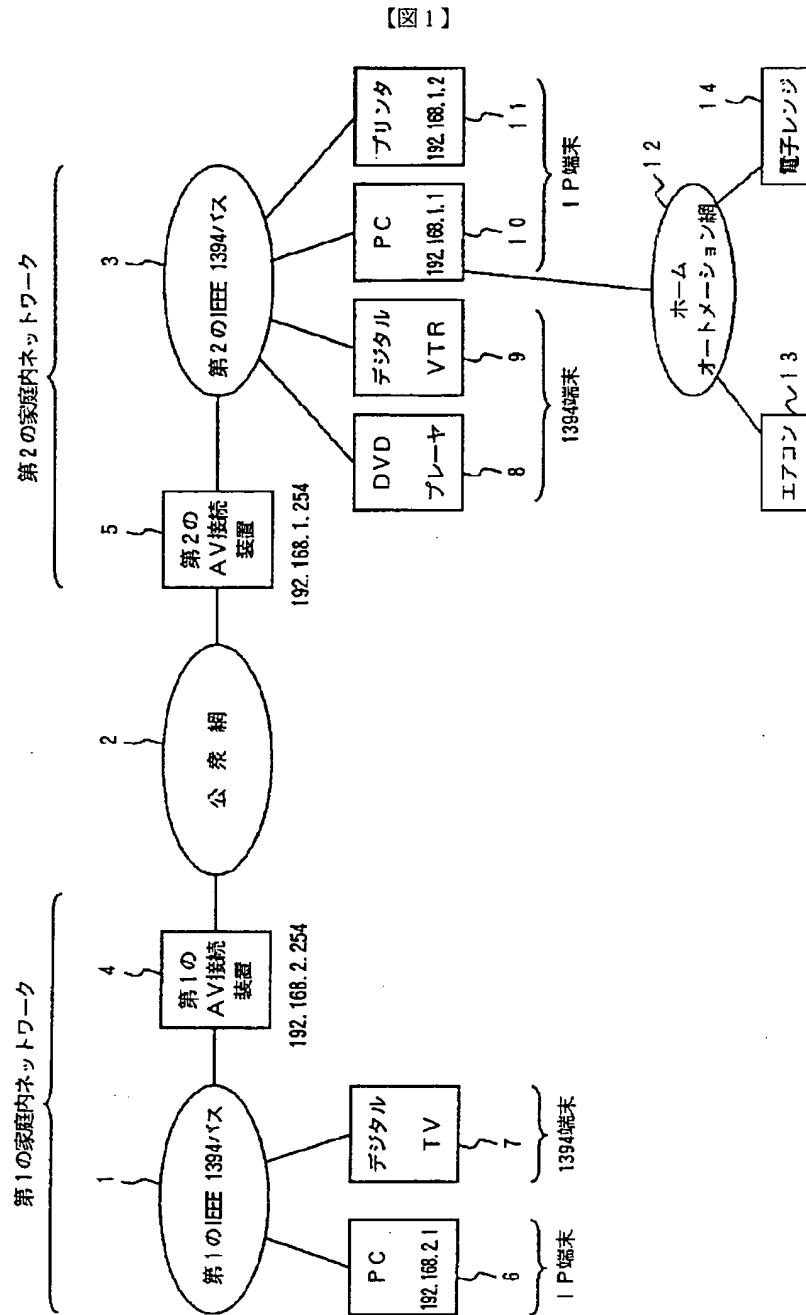


【図13】

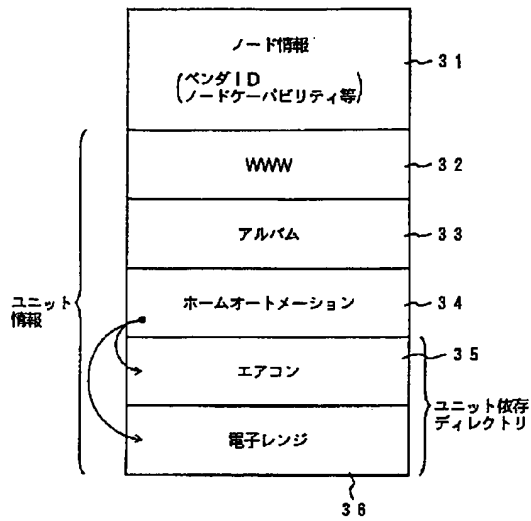


【図3】

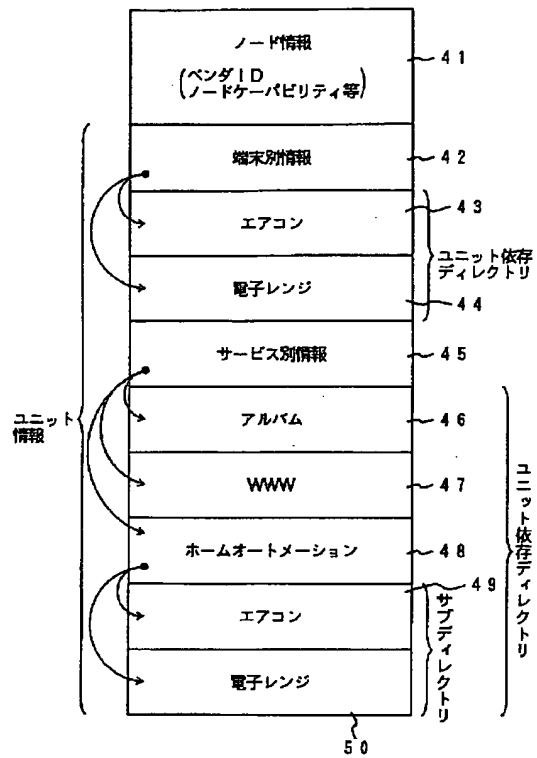




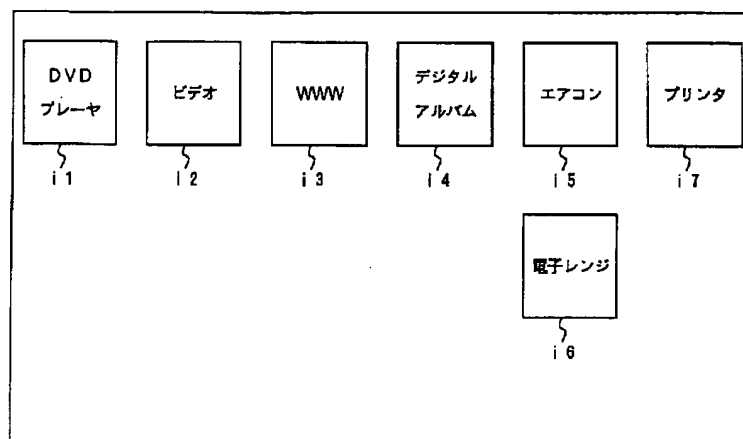
【図4】



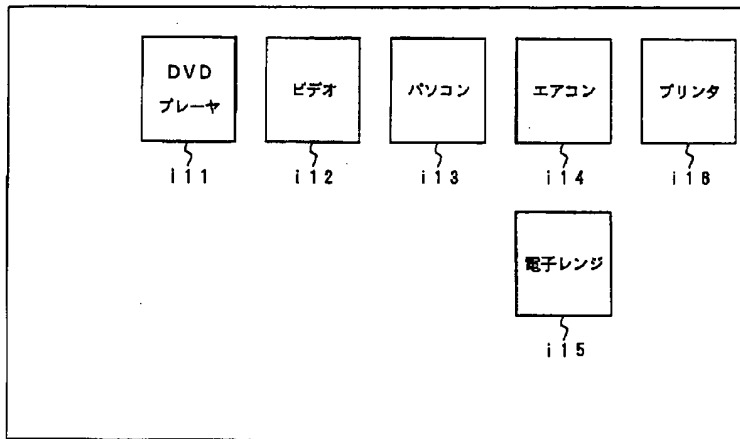
【図5】



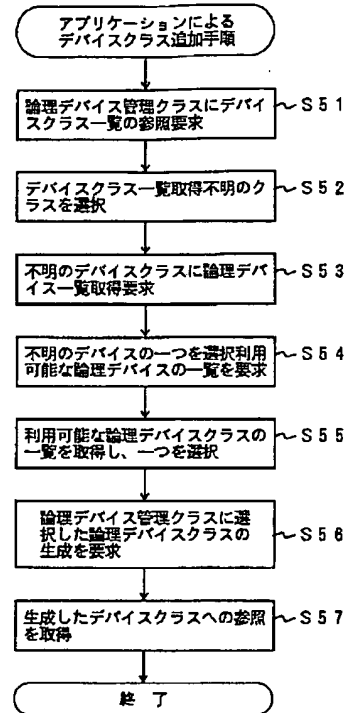
【図7】



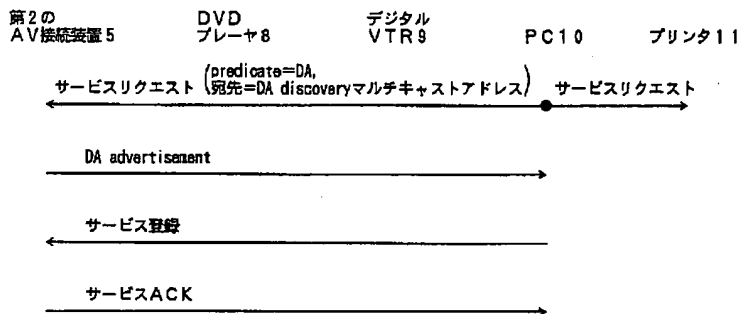
【図8】



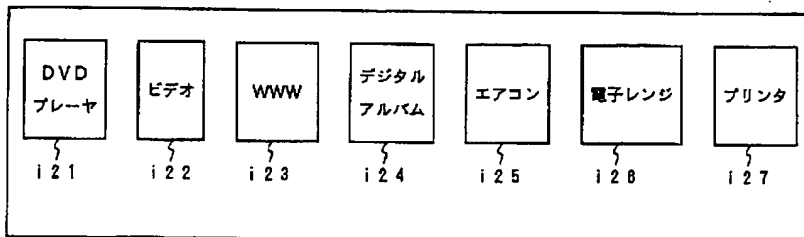
【図28】



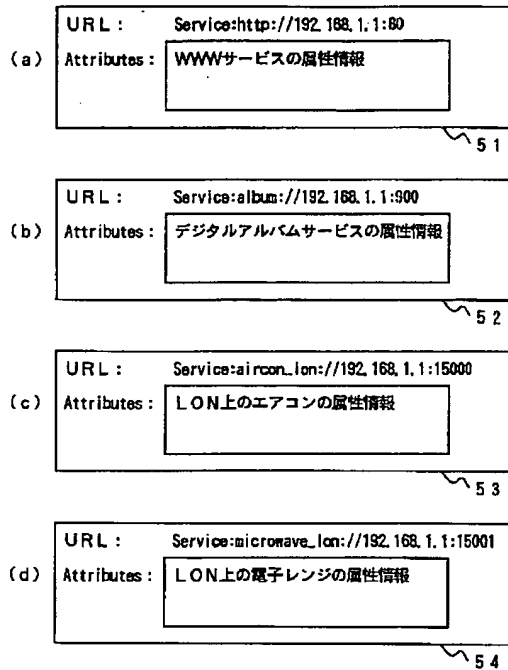
【図9】



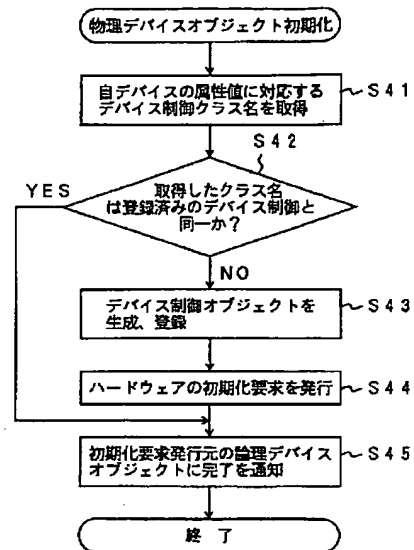
【図11】



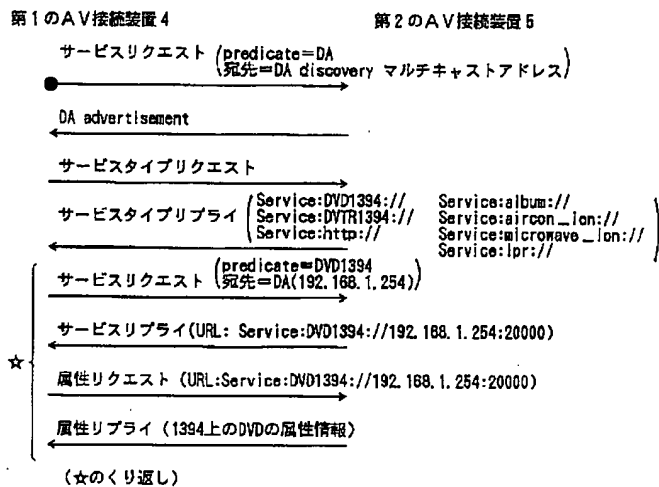
【図10】



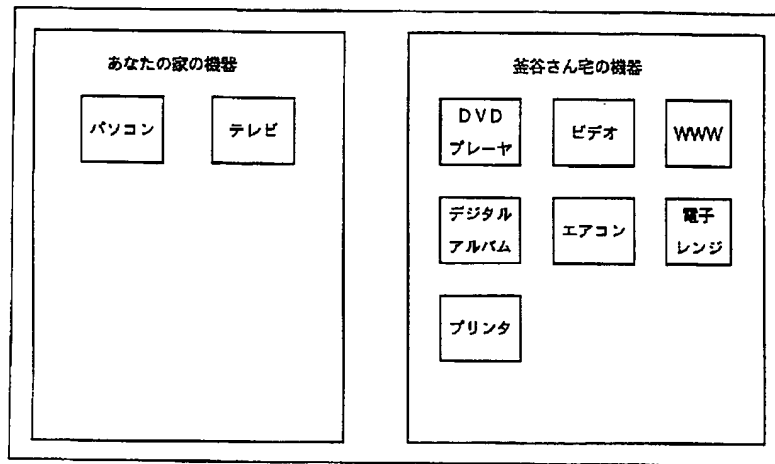
【図26】



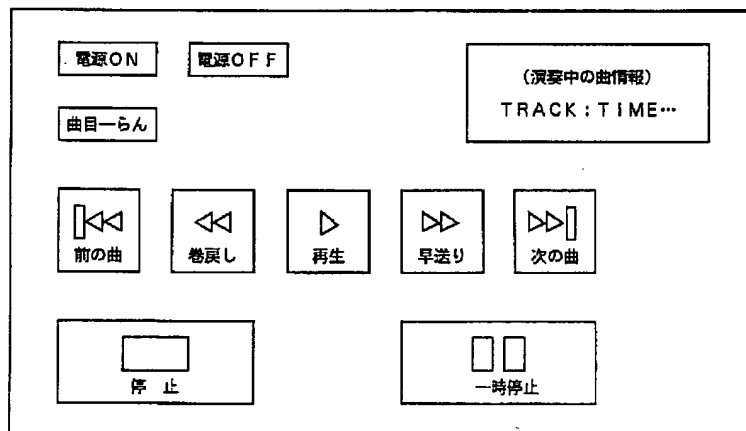
【図12】



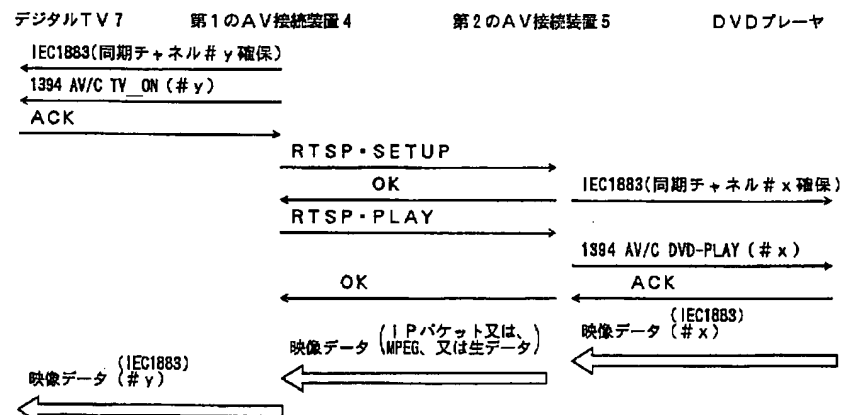
【図14】



【図15】

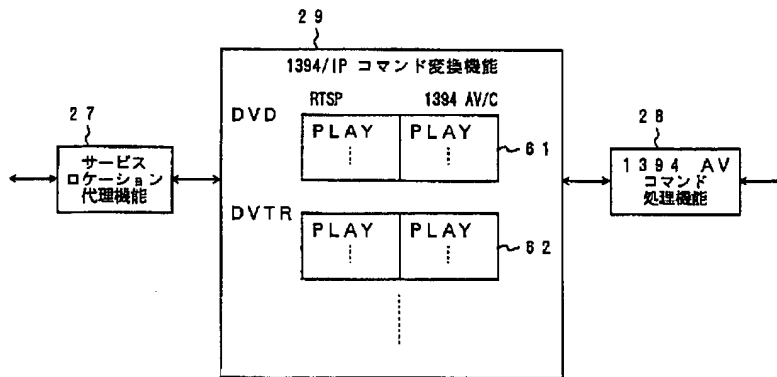


【図16】

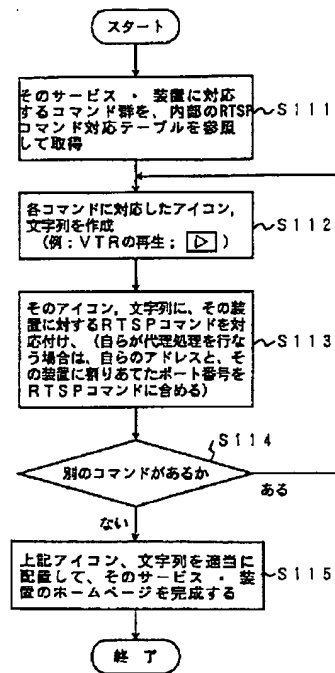




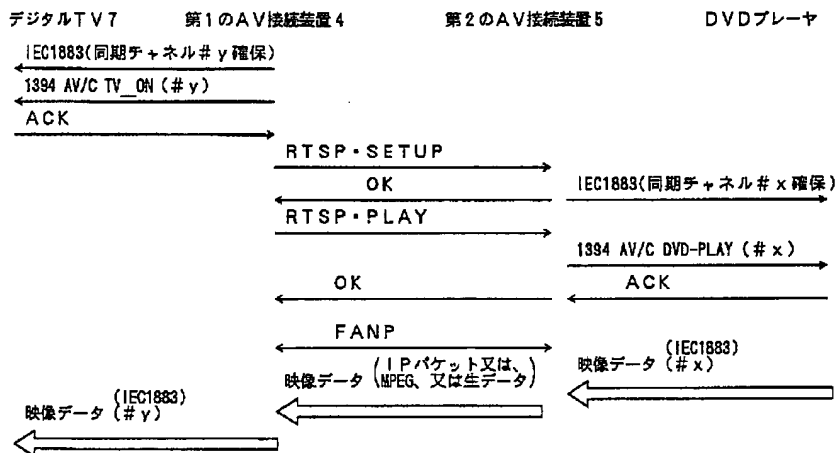
【図17】



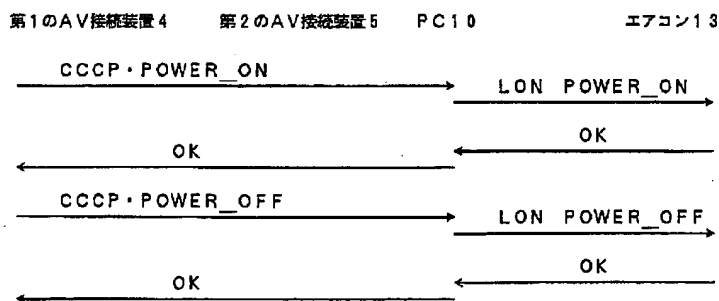
【図38】



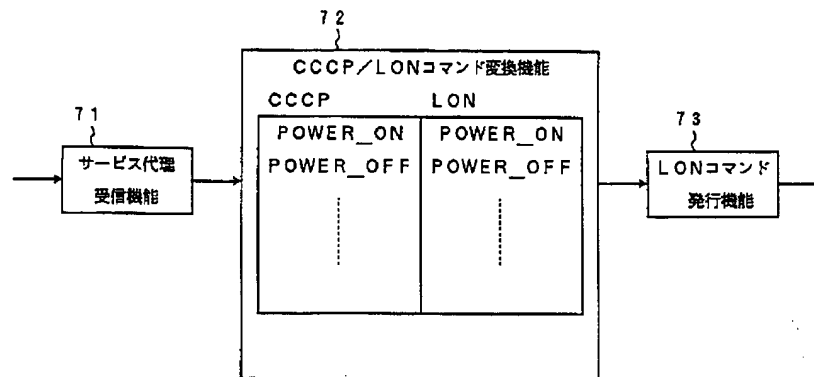
【図18】



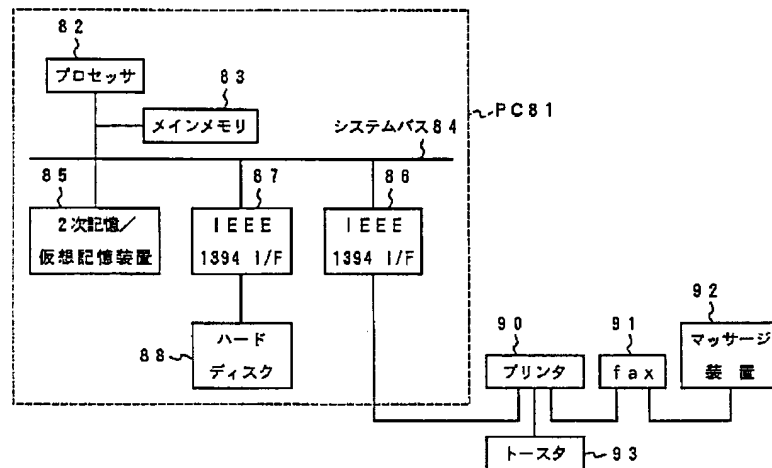
【図19】



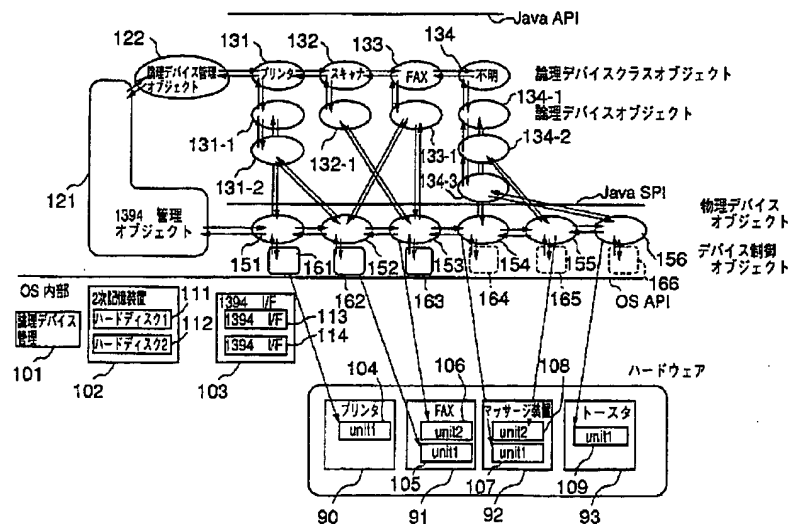
【図20】



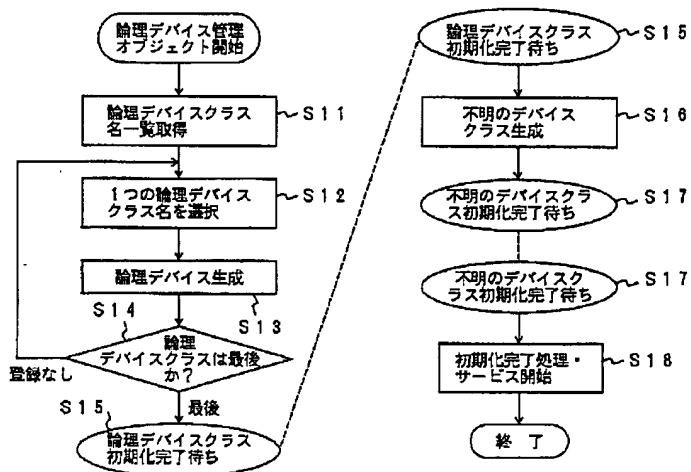
【図21】



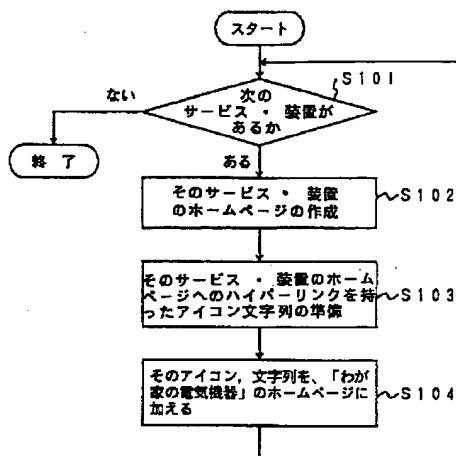
【図22】



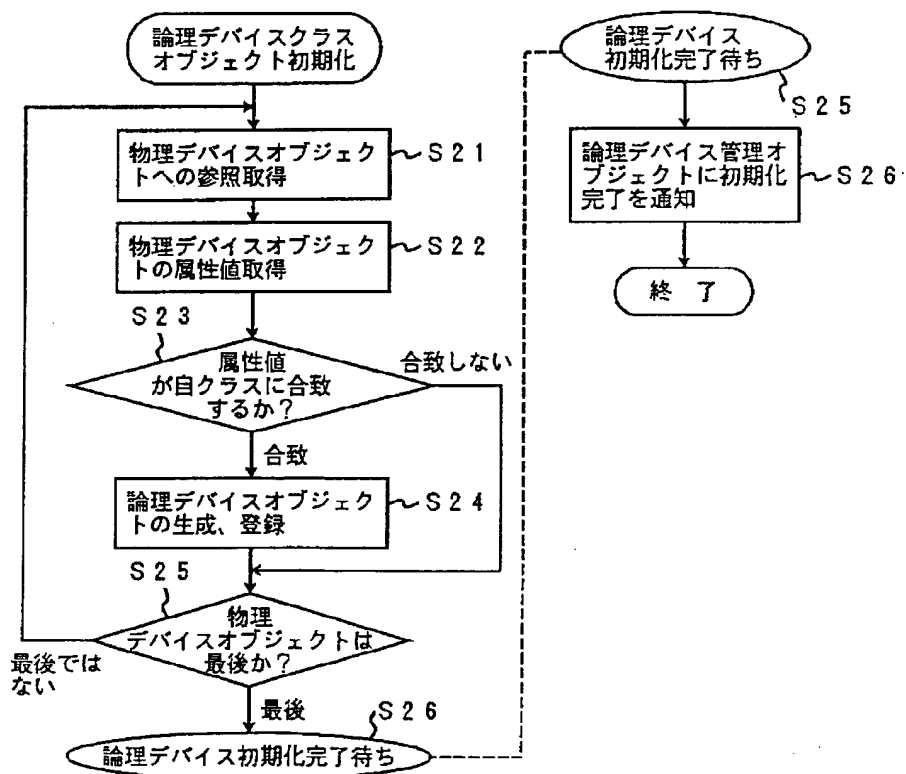
【図23】

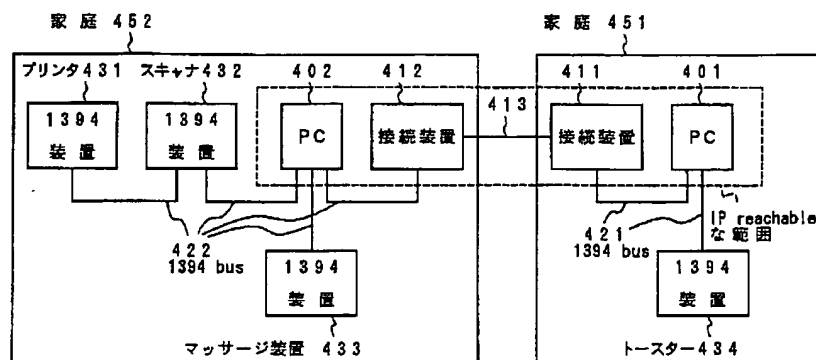
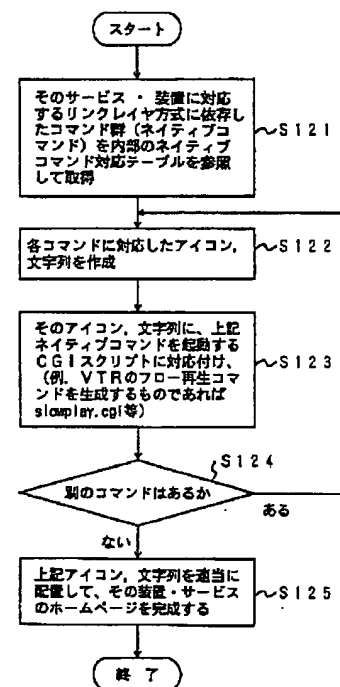
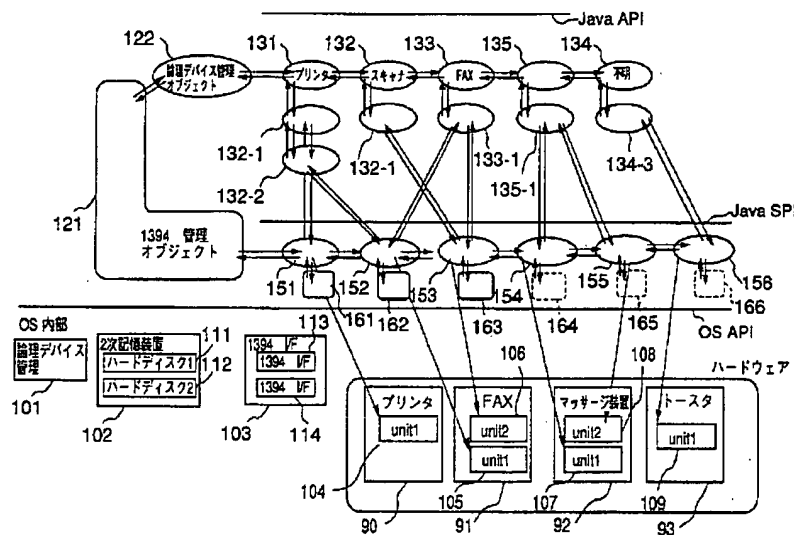
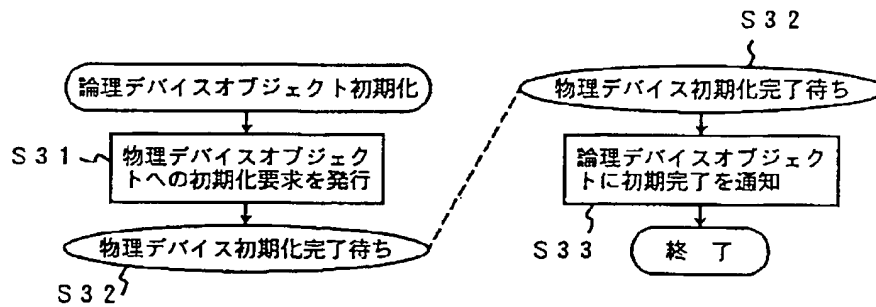


【図37】

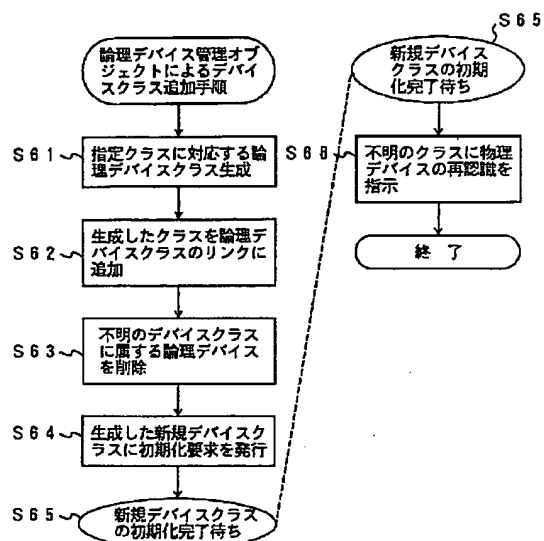


【図24】





【図29】

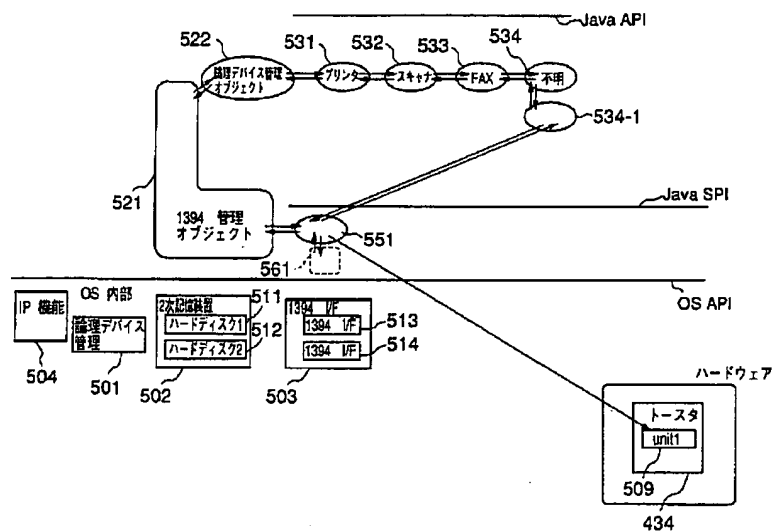


【図50】

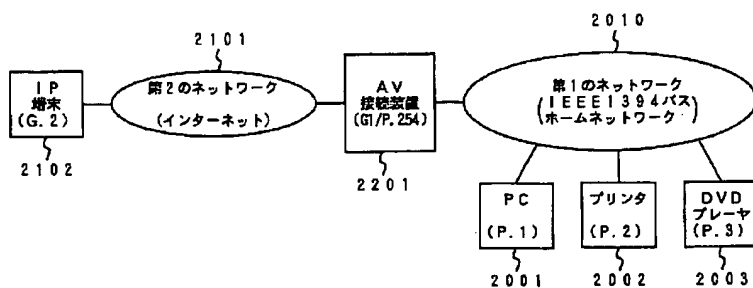
RTSPコマンド対応テーブル

	RTSPコマンド	1394 AV/Cコマンド
DVDプレーヤ	PLAY (パラメータ)	PLAY (パラメータ)
	...	...
デジタルVTR	PLAY (パラメータ)	PLAY (パラメータ)
	...	...
...	...	...

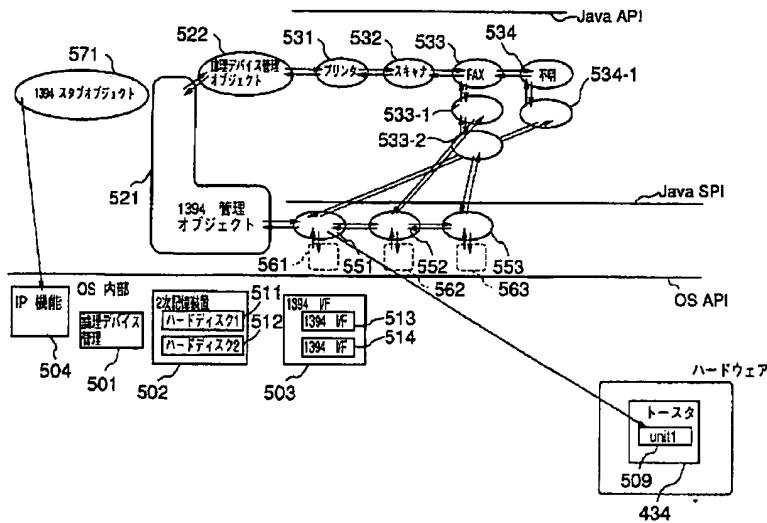
【図31】



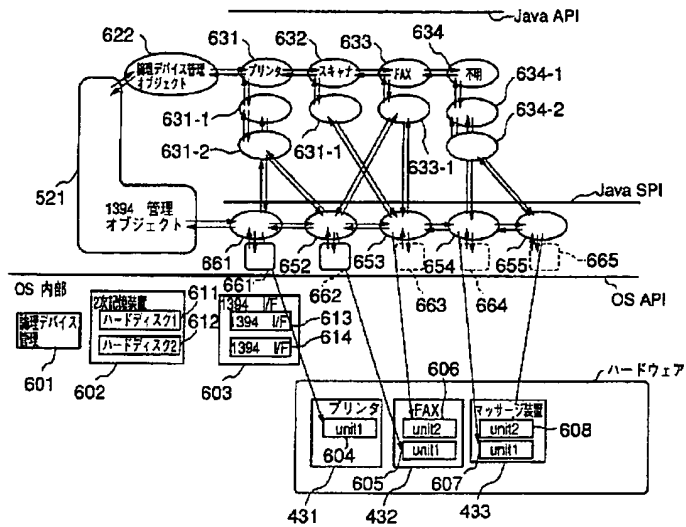
【図51】



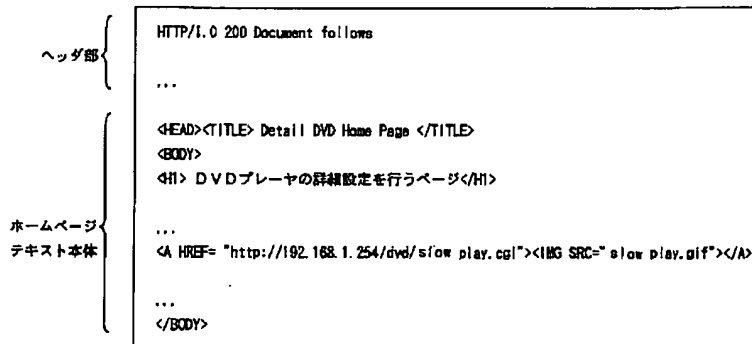
【図32】



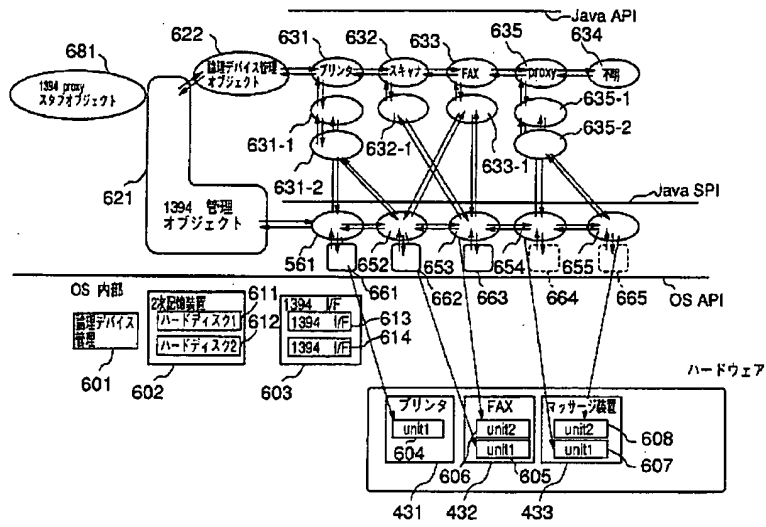
【図33】



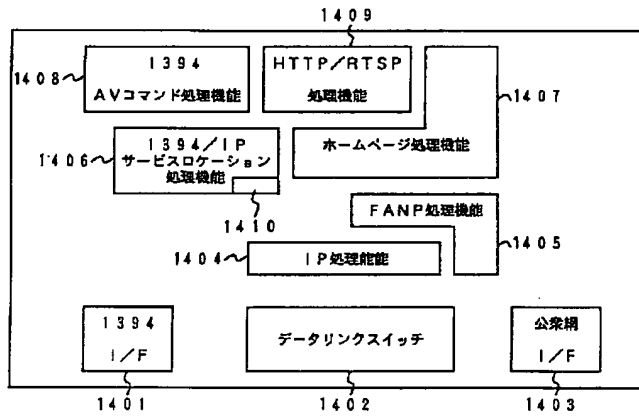
【図46】



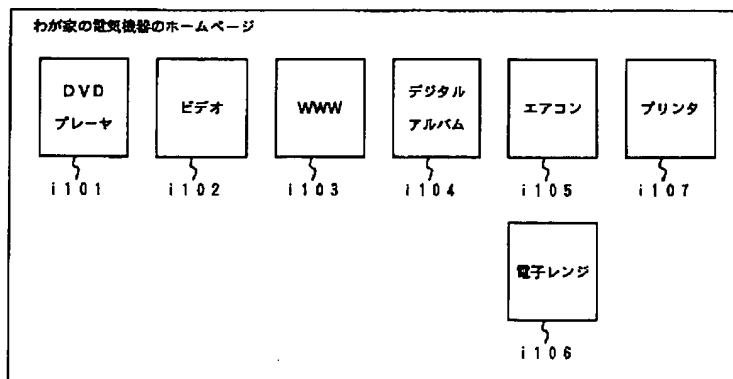
【図 3 4】



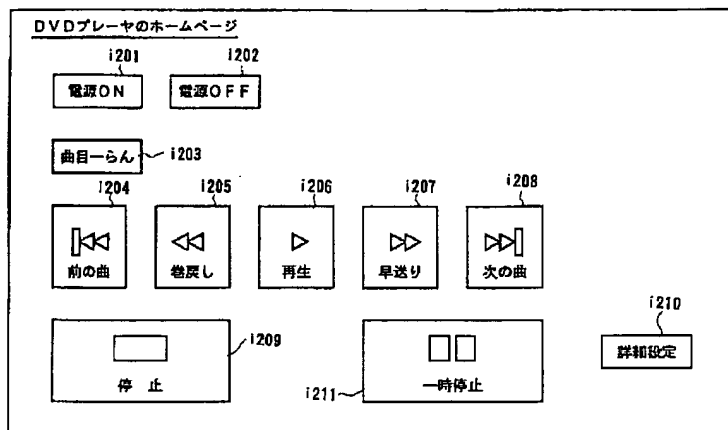
【図 3 5】



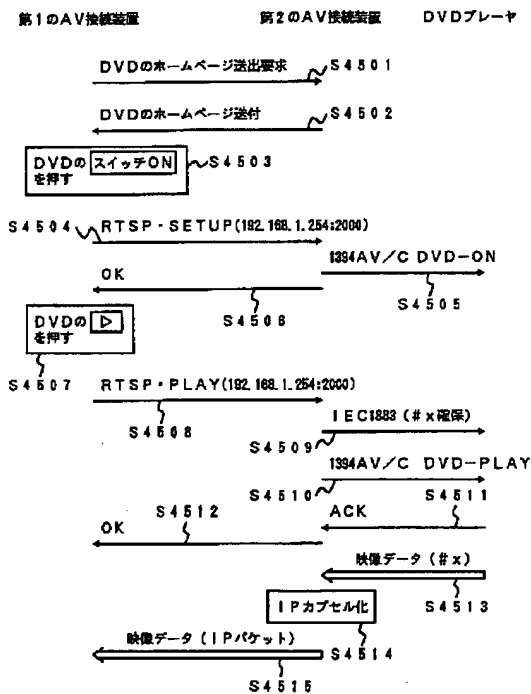
【図 3 6】



【図39】



【図40】

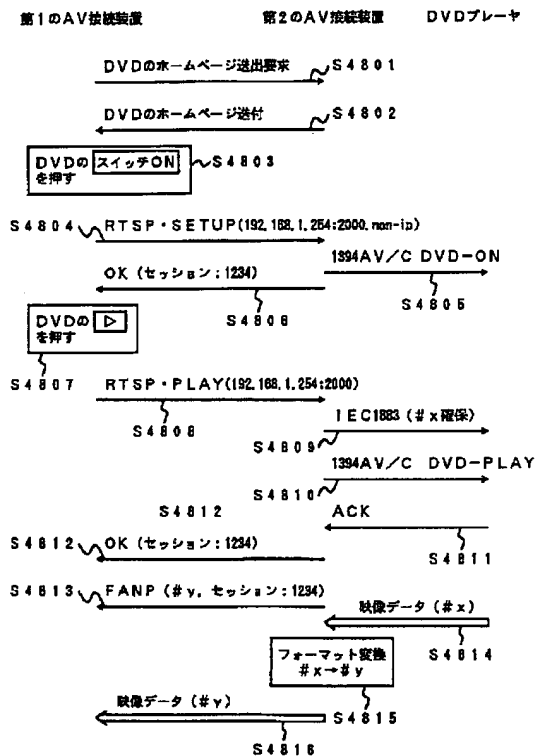


【図55】

アドレス・ポート番号交換テーブル

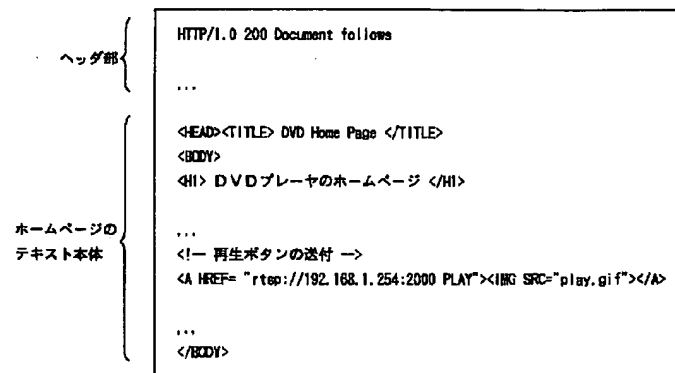
インターネット側		ホームネットワーク側	
IPアドレス	第1のポート番号	IPアドレス	第2のポート番号
G.1	2000	G.3	80
G.1	2002	G.2	80
G.1	2004	G.1	80
⋮	⋮	⋮	⋮

【図43】

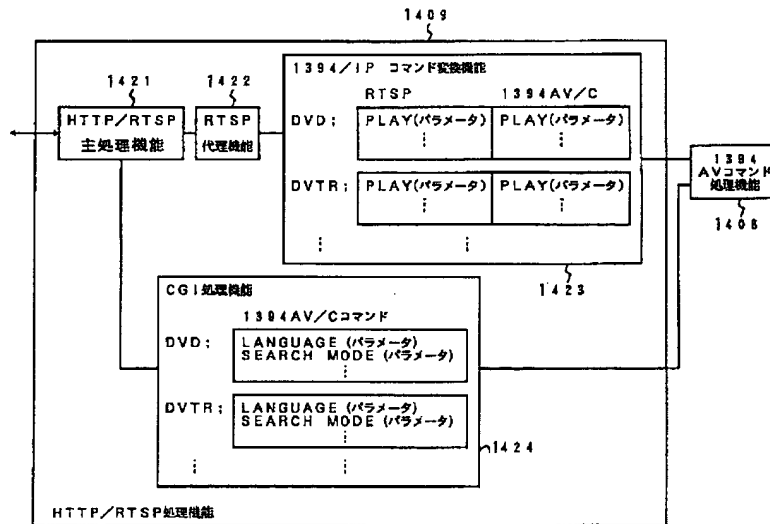




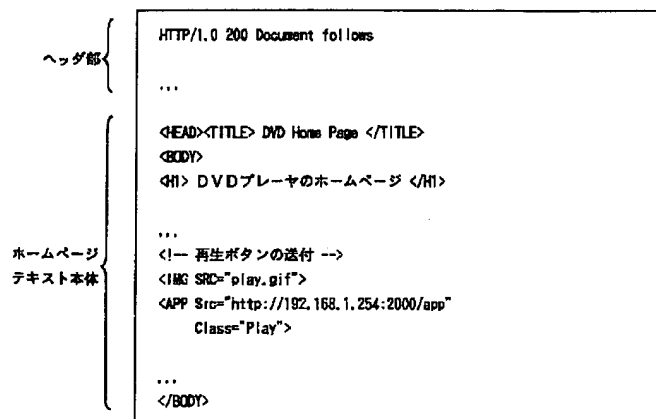
【図41】



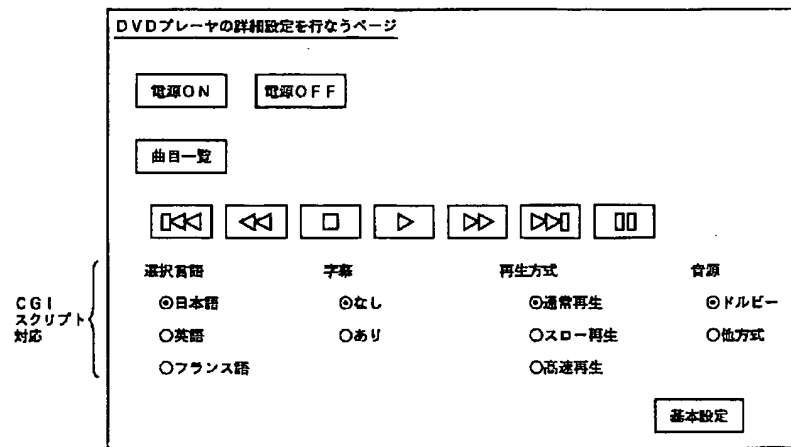
【図42】



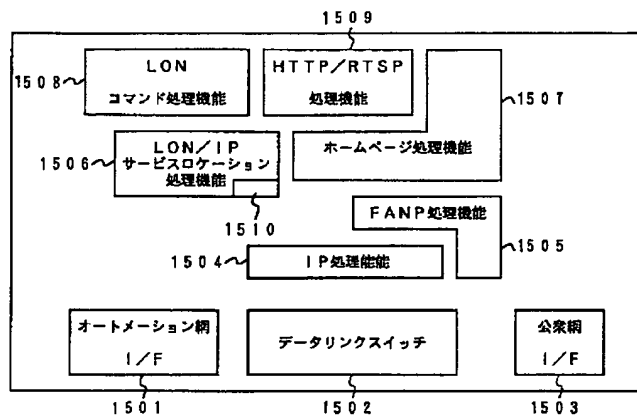
【図44】



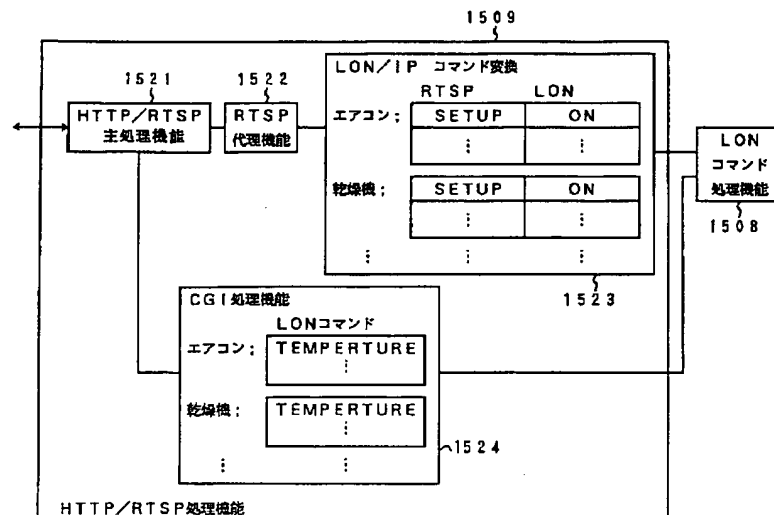
【図47】



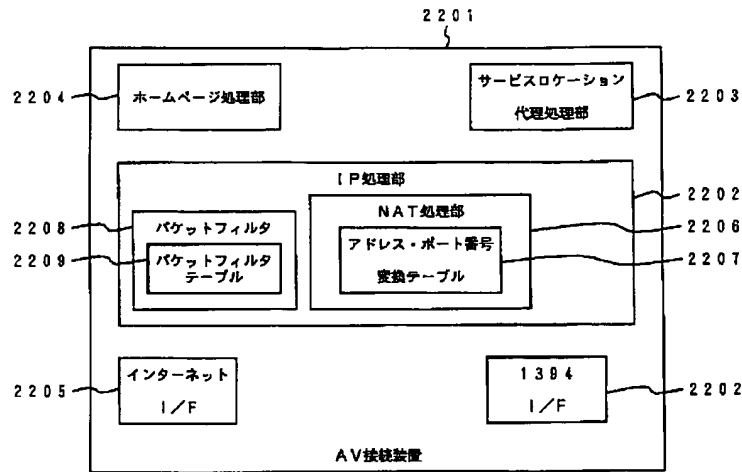
【図48】



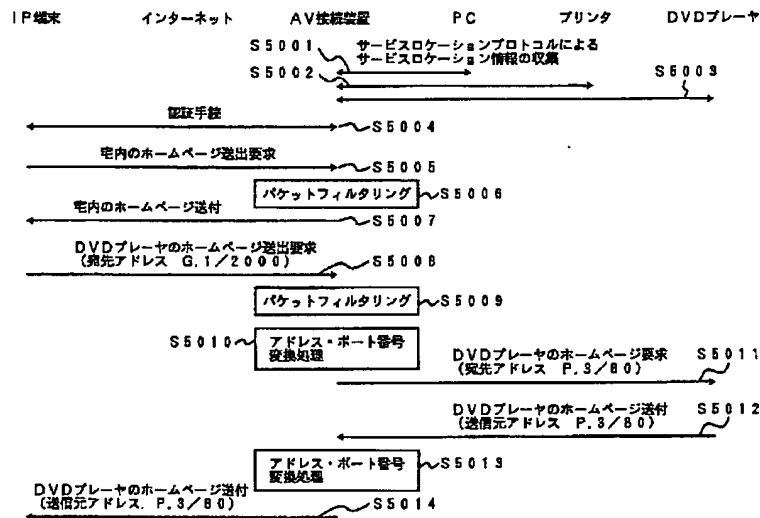
【図49】



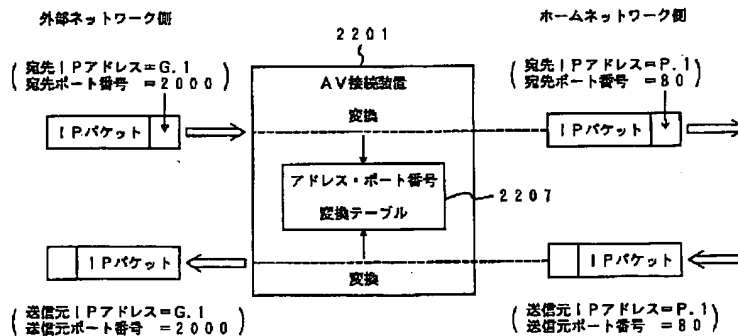
【図52】



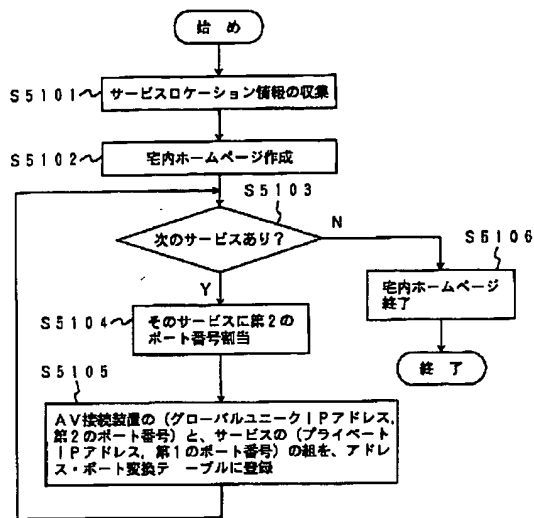
【図53】



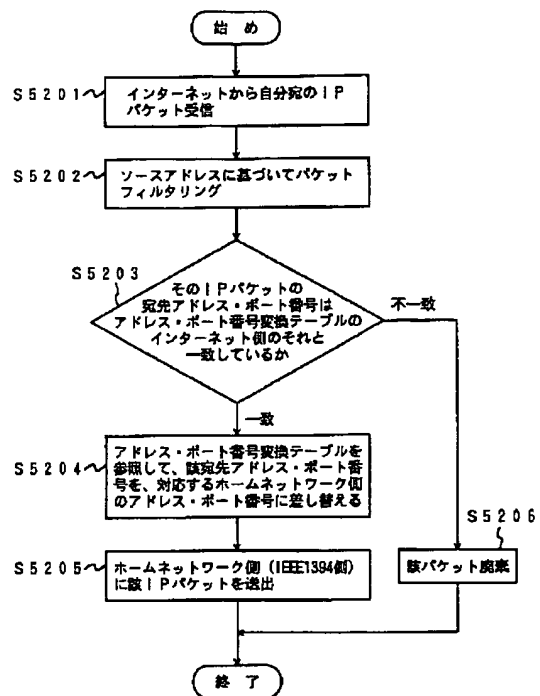
【図58】



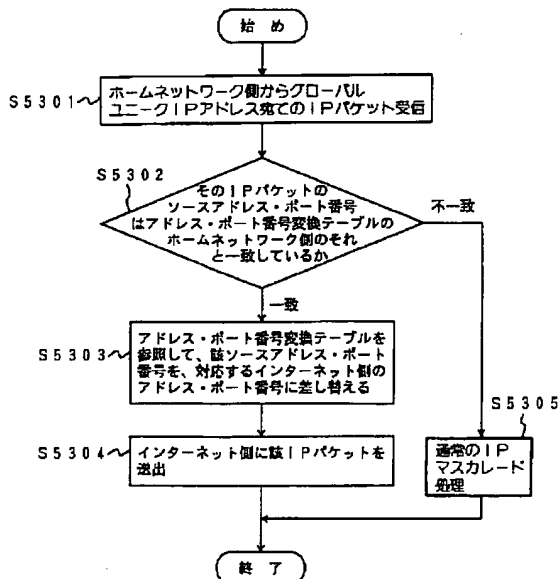
【図54】



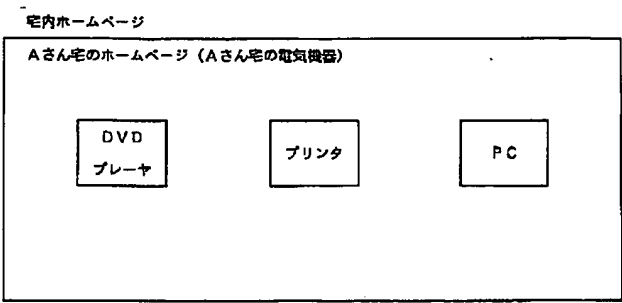
【図56】



【図57】



【図 5 9】



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13/00

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1 0 1 B  
3 0 5 B

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52 images

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